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ABSTRACT

This workshop presenter's guide is intended for use by administrators in training one another in the Project Leadership program developed by the Association of California School Administrators (ACSA). This manual is divided into four areas of technology and education: (1) Administrators and Computers, (2) Computer-Assisted Instruction (CAI), (3) Videodisk Instruction, and (4) Programming Languages. After an introduction, chapter 2 discusses hardware and software and how they are used in schools; common programs for administrators (word processing, electronic spreadsheets, and integrated packages); special administrative application programs (attendance, scheduling, and Individualized Education Plan (IEP) management); and information processing (grade book programs, automated scoring and diagnostic analysis, and group CAI). Chapter 3 discusses the topics of drill and practice, tutorial and simulation-oriented computer-assisted instruction, instructional games, and word processing. Chapter 4 discusses instructional design, mastery learning procedures, and benefits to administrators. Chapter 5 discusses programming languages (Basic, Pascal, and Logo). The guide contains masters of 30 numbered transparencies, participants' work sheets, 4 handouts that provide workshop summaries and bibliographic references, and a 25-item reference list of sources cited or referred to in the text. (IW)

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# The Role of Technology in School Improvement

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Sam Miller
John Woodward

PROJECT LEADERSHIP PRESENTER'S GUIDE

Prepared by the Research-Based Training for School Administrators Project

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This material is a product of the Research-Based Training for School Administrators Project (RBTSA). The work was supported by a subcontract with the American Association for School Administrators, but does not necessarily represent the views of that agency.

For more than four years, the Center for Educational Policy and Management at the University of Oregon has been testing the use of collegial support groups and peer teaching to make research findings available to school administrators. By combining research-validated practices and the results of long-term experience in schools, the Research-Based Training for School Administrators Project (RBTSA) seeks to help administrators enhance their effectiveness. This project uses an existing professional development program as a basis for its training efforts. This program, known as Project Leadership and developed by the Association of California School Administrators (ACSA) over ten years ago, is comprised of a year-long series of statewide conferences and regional meetings and was modified to complement RBTSA's emphasis on broadcasting the results of research in a usable form.

RBTSA emphasizes peer interaction in casual conversations as well as in formal meetings and conferences. Administrator talk is formally initiated through two vehicles: (1) an individualized professional growth plan and (2) scripted training modules called Presenter's Guides, which are used for formal presentations and as self-study guides. This is a Presenter's Guide developed by the team at the Center for Educational Policy and Management (CEPM).

All members of our team at CEPM have contributed in some way to this material. They include authors Doug Carnine, Sam Miller, and John Woodward; reviewers Susan Gourley, Herm Schwartzrock, and Sammie McCormack; editor

Susan Degen; and project director Kathleen Fitzpatrick. We are also grateful to Terri Williams, word processing specialist, and Linda Lumsden, publications assistant.

## Preface to the Presenter

This manual is divided into four areas of technology and education: (1) administrators and computers, (2) computer-assisted instruction, (3) videodisk instruction, and (4) programming languages. It is our hope that the presenter will freely select areas (and even topics within an area) that are most relevant to his or her interest or to the needs of the audience to whom the information is being presented. The approximate length of presentation time for each area can be found in the table of contents.

It should be noted that because computer technology is a rapidly changing field, some of the information in this manual will be incomplete, or even incorrect, in the near future. This is especially true of prices for equipment and software. For example, a week before the last draft of this manual was submitted, one of the seven major computer companies that we cited in the manual stopped making computers. We revised the manual where it was appropriate, but the example should be instructive to anyone interested in technology and education.

*A note on the structure of this manual. An outline for the text has been provided. Topics presented on a page of the text are outlined on the opposing page (i.e. left side) of the manual. This should assist the presenter in delivering material or in making a quick reference to the text.

## USING THE GUIDE

The guide is written so that it can be read aloud, but we believe you will want to make changes and provide your own examples. You should adapt the material to your personal needs and the needs of your audience.

You are equipped with the Presenter's Guide, which contains a script and suggestions for the conduct of the session. In the back you will find the following: (1) masters of numbered transparencies that have been designed to give visual emphasis to the main points of your presentation, (2) participants' work sheets that correspond to suggested activities, (3) handouts for participants that provide summaries of the workshop content and specific bibliographic references, and (4) a reference list of the sources cited or referred to in the text.

## PRIOR TO THE WORKSHOP

1. Review the guide--script, transparency masters, and handout materials.
2. Prepare copies of handout materials for each participant.
3. Prepare transparencies from "masters." These are especially appealing when colors are added.
4. Arrange for meeting room facilities: Ideally, the facilities will offer space for participants to write as well as areas for small group discussion.
5. Arrange to have an overhead projector, screen, three-prong adapter, and extension cord in the meeting room. Insure that the room is equipped with a chalkboard or flipchart visible to all participants. Make sure you have chalk and marking pens.
6. Arrange for coffee or other refreshments, if desirable.

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# I. Introduction

## Manual Outline

### I. INTRODUCTION

Page 1

* The computer revolution has become unmanageable
* Too many decisions and too little forethought or policy
* The problems of buying a computer:
* Much of the software is an instructional step backwards

## I. INTRODUCTION

The computer revolution has become unmanageable. Swamped with a new vocabulary, package deals from every kind of computer vendor, and pressure from all directions to offer some form of computer instruction to students, school administrators face too many choices. For the most part, computers have been integrated into the schools with little forethought or long-range planning (Rogers, 1984). The problem is not so much comprehending computers, as it is implementing their use in schools.

Most of us have a general idea of what computers can do. Exactly how this new technology is best incorporated in today's schools seems to be the main dilemma. As most administrators already know, there are more issues to this technology than bulk ordering ten of a company's latest model computer and using them just as the nearest district does. Targeting the proper computer-related technology--from lap-size portable computers to video disks--for a particular setting is a complicated decision.

Finding the right computers, at the right price, for the right educational settings is no small task. It seems that new computers appear and old ones disappear each month. An administrator may defend his or her choice of computers because it has been on the market for a long time or because the educational software written for one brand may be triple that of its nearest competitor or because the vendor's package discount price was a steal. But a closer look at most of that software reveals great inadequacies (Splittgerber, 1979; Aamandam and Kelly, 1981-82; Torrance, 1980). If judged purely from a teaching standpoint, much of what has been programmed on those disks is a step backward, hardly justifiable if it were

* Two uses of computers:

    1) to teach subject matter other than computer science
    2) to teach about computers themselves

* These two uses are incomplete: other uses of computers are ignored

* This manual presents a broad outline of what is instructionally sound and feasible today

* Do ACTIVITY #1

## Vocabulary

Networking: Linking computers together so that they are connected to one main computer. Also, using devices such as keypads to send information to a main computer where it is processed.

Videodisk Instruction: Instruction presented with a videodisk player. A videodisk player uses disks about the size of a 33 1/3 rpm record and reads information on the disk by a needle or a laser. About 30 minutes of information can be stored on one side of the disk using different forms of media: slides, videotape, computer graphics, etc.

described without the aura of the computer. Clearly, then, buying computers involves more than a good price and the sheer quantity of available software that runs on a particular brand.

Typically, schools integrate their computers into instruction in two ways--(1) to teach subject matter other than computer science and (2) to teach about the computers themselves (Rogers, 1984). A physics simulation is an example of the first category; a class in BASIC programming exemplifies the second. But this typical division obscures and underrepresents other powerful uses of computer technology such as networking and video disk instruction. However, these two new uses of computer technology--especially video disks--are only slowly gaining acceptance among educators (Neill, 1984).

This presentation offers a broad outline of computers and their potential applications for schools. It is hoped that the information will help you, the administrator, identify the problems facing your school or district and, more importantly, the trade-offs involved in any decision about computers for schools. In designing this manual, the authors felt that it was more appropriate to present the whole range of options than to discuss just a few of them in depth. Computer technology should be looked at as a tool for different audiences. Most of all, the technology should be examined critically, well beyond the initial public enthusiasm, to see if it truly improves a student's learning, a teacher's instruction, or an administrator's work.

DO ACTIVITY #1

## II. Administrators and Computers

presentation time: one hour

## Manual Outline

## II. ADMINISTRATORS AND COMPUTERS

Page 3

A. Hardware, Software, and How They're Used in Schools Today

* SHOW TRANSPARENCY #7

The Johns Hopkins University report

* The number of microcomputers in school has grown significantly
* SHOW TRANSPARENCY #1

### Vocabulary

Hardware: The machine itself as well as any other devices such as disk drives, monitors, printers, etc.

Software: The programs that run on the machine. They are usually on floppy disks, sometimes on tapes.

## II. ADMINISTRATORS AND COMPUTERS

### A. Hardware, Software, and How They Are Used in Schools Today

SHOW TRANSPARENCY #7

What kind of computer should a school or district purchase? Should it buy the same brand that others are buying? Can a new computer be integrated with the ones the school or district already owns? These are a few of the complicated questions that face school administrators. The answers are not general solutions applicable to every school or district, but rather a set of trade-offs. A good beginning would be to look briefly at how schools are acquiring computers and what they are doing with them.

From December 1982 to February 1983, the Johns Hopkins University Center for Social Organization of Schools surveyed principals and teachers who used computers at approximately 1,600 elementary and secondary schools in the U.S. (Becker, 1983). The results of the survey have been important in determining a wide range of computer policies for public and private schools in this country.

SHOW TRANSPARENCY #1

As is shown here, the number of microcomputers in schools grew significantly in the early part of this decade. It has been estimated that as of April

The John Hopkins report (continued)

* How often are the microcomputers used?

* SHOW TRANSPARENCY #2

* Secondary schools have double the number of microcomputers compared to elementary schools

* SHOW TRANSPARENCY #3

* Differences in the way elementary and secondary schools use computers

  1) More drill and practice in the elementary schools
  2) More instruction about computers in the secondary schools
  3) Teacher reactions to computers

* SHOW TRANSPARENCY #4

* Buying patterns of school districts: Apple, Commodore, Radio Shack

1984, there were about 350,000 computers in elementary and secondary schools throughout the country. This is an average of four computers per school (Bork, 1984).

How often each student uses these computers and for what purpose can be seen above.

SHOW TRANSPARENCY #2

Secondary students have more access to computer time than elementary students. This is only logical, since secondary schools tend to have twice as many microcomputers as elementary schools.

SHOW TRANSPARENCY #3

There are also differences in the ways elementary and secondary schools use their computers. In the elementary grades, there is more drill and practice, as well as tutoring for special students. In the secondary grades, there is a greater emphasis on introductions to computers, programming instruction (BASIC in 95% of the cases), and teacher record keeping. Equally interesting is how teachers view the impact of the computers. Few educators perceive microcomputers as being beneficial because of the limited access most students have to a computer during the week.

Before returning to any of the questions we asked at the very beginning, we should look at buying patterns for 1983.

SHOW TRANSPARENCY #4

* SHOW TRANSPARENCY #5

* The kinds of software that will run on computers: Apple is popular in schools because of its quantity of educational software

* The cost of computers for schools today

* SHOW TRANSPARENCIES #6A and #6B

## Vocabulary

Application Programs: Software programs designed to do special jobs, such as word processing, saving information, helping calculate budgets, etc.

These figures may be deceptive because they do not reflect the number of a certain brand of computers at a school. Instead they indicate only that the school purchased at least one computer of that type. Apple was the biggest seller, followed by Radio Shack and Commodore. This picture may change in the near future as more IBM-compatible machines enter the market.

It is equally interesting to look at what kinds of software (instructional or application) will run on these computers.

SHOW TRANSPARENCY #5

From the 81 new software titles Electronic Learning magazine received in the summer of 1984, we can glean an idea of which kinds of programs are written for which machines. For example, 69 percent of the programs written for the Apple computers are instructional programs. This is one indication of Apple's popularity in the schools. For administrators who value a wide array of educational software for their schools' computers, Apple would be a good buy. On the other hand, the high percentage of application programs for the IBM PC may be of interest to those who want to use a computer strictly for administrative purposes.

Cost is certainly a major factor to consider when buying computers.

SHOW TRANSPARENCY #6A and #6B

The prices you see listed here were true of retailers and discount houses in the New York area in June 1984. Not listed are the package deals arranged by certain computer companies such as Apple and IBM. Nonetheless, you can compare the prices of different brands for a computer with one or two disk drives and a monitor.

B. Common Application Programs for Administrators

* SHOW TRANSPARENCY #7 (AGAIN)

* The advantages of package deals with computer vendors

* The issue of hardware compatibility: can you connect different computers to different printers, drives, or monitors?

* Different uses of computers for different people

  1) Administrators will want application programs
  2) High school programming classes can use any kind
  3) Elementary classes need one with a wide range of instructional software

## Vocabulary

Hard Disk: A type of disk drive that often attaches to the computer. Unlike an ordinary disk drive, it stores much more information and, consequently, is much more expensive.

Hardware Compatability: The ability of different pieces of hardware to be connected to each other and operate correctly. For example, a Commodore 64 computer must have a Commodore 64 disk drive for it to receive information from the disk. However, it may be connected to many different brands of monitors.

Interface: To connect, as in devices, so that each item runs properly.

Now we can return to our original questions.

SHOW TRANSPARENCY #7 AGAIN

There are good arguments for a school or district to stay with one brand of computer. Certainly lower prices or discount package deals are better negotiated when there are large quantities involved. Having computers that run the same programs is also an advantage; the same software can be used in different classrooms or schools in a district. Further, there is increased hardware compatability. Schools normally have far fewer printers than computers. Having a printer that can be shared by a number of classrooms is economical and possible only if the printer is connected to all the same brand of computers. An Apple printer, for example, does not automatically connect, or "interface," with a Commodore 64 computer. Finally, different brands of computers cannot be easily integrated in any sense unless they are specifically designed to be compatible with a given machine. For example, Franklin computers were <u>built</u> to be compatible with Apple IIs; Atari computers were not.

Buying computers that are all the same brand ignores the fact that different users have different needs, however. Administrators, for example, may want a few relatively expensive computers than run a wide range of application programs. These computers may require more memory and special features, such as hard disks. Given these requirements, there is little reason for administrators to be concerned with whether or not the software for such computers will run on those machines in the classrooms.

By a similar argument, the best brand computer for the elementary setting may be different from the one for a high school class. A tenth grade BASIC programming class can use any popular brand of microcomputers. On the

* The need for a policy
* Unit price should not be the sole determinant

1. Word Processing

* Word processors vary a great deal in price
* More expensive programs take more time to learn
* Word processors allow you to delete, insert, and move text
* Function keys allow you to do extra tasks

## Vocabulary

Application Programs: Software programs designed to do special jobs, such as word processing, saving information, helping calculate budgets, etc.

Function Keys: Extra keys found on some computer keyboards, usually to the right and/or on top. They permit the user to perform extra tasks.

other hand, the best computer for the elementary classroom is probably one that runs a wide range of instructional software. Yet even this view should be tempered by budget constraints and particular software needs. The most popular software (e.g., LOGO, Rocky's Boots) tends to be available on computers that vary by hundreds of dollars in per unit cost.

In the end, buying computers requires having a clear district policy that identifies the needs of a particular educational setting and that has projections on how those needs may change in the near future. With such a policy and the limits of the budget, an administrator is in a much better position to decide what kind of computers are the best buy for the school or the district. Clearly, unit price should not be the sole determinant in this decision-making process.

## B. Common Application Programs for Administrators

### 1. Word Processing.

Cost. Word processing is undoubtedly the most popular application program for microcomputers, but with such popularity comes an extraordinary range in prices--from $50 to $500--and options. Some programs can be learned in an hour: others require extensive training. As a rule, the more expensive programs take more time to learn, but they generally perform many more functions than word processors that cost less than $100.

Capabilities. All word processors permit some kind of editing. Text can be deleted, inserted, and moved. Some programs allow you to search an entire file or document in order to replace words. This is handy if you are writing the same letter to several people and just want to change the name as it appears in the text. The more powerful word processors allow you to "set" the function keys on the computer keyboard for editing tasks that you do

* Color monitors provide resolution problems
* Stay away from televisions

2. Electronic Spreadsheets

* Like word processors, they vary greatly in price
* They're good for calculating budgets, supply use, enrollments, etc.
* They allow you to make a change and see how it affects other changes

## Vocabulary

| | |
|---|---|
| 80 Column Format: | A typewritten page usually allows a maximum of 80 letters on one line. On computers, each space that a letter would occupy is called a column. |
| Integrated Packages: | Application programs that combine an electronic spreadsheet, a word processor, a data base manager, etc., into one software. This means that all of these different programs can be used by the computer at one time. The advantage here is that you don't have to save information on one program, take it out, load the next one, and so on. |

frequently. For example, you might set the key labeled F5 on your keyboard to automatically create three blank lines in a text where, at a later time, you would enter a student's test score.

Monitors. When considering word processors, beware of color monitors and television sets. Color monitors do not provide good resolution for 80 column formats (i.e. where the text is 80 characters wide--as it would be on a normal typewriter). Programs for color monitors often work best when they split the screen into 40 columns. This means that one line on the screen is about half a line on the printed page. The obvious disadvantage here is that you cannot see exactly how a document will look until it is printed. Television sets are also a poor choice when used with word processors. Not only do they offer poor screen resolution, but some people find them difficult to look at for extended periods of time.

More important than choice of monitors, however, is how well your word processor works with other programs. This will be clearer shortly in the discussion of other application programs and integrated packages.

2. Electronic Spreadsheets.

As with word processors, a variety of electronic spreadsheets are on the market, ranging in price from $90 to more than $500. The most outstanding advantage of spreadsheets is that they allow the user to ask "what if" questions. If you are projecting budgets, supply uses, enrollments, etc., the program can calculate the effect of a change in one variable on other variables. In this sense, an electronic spreadsheet is an automated ledger.

Let's say that you're figuring the cost of paper supplies for the next school year. What happens if the cost of paper rises by ten percent? The effect of this on the overall budget is quickly calculated and reflected

2. Electronic Spreadsheets (continued)

   * With some programs, you can copy formulas or data easily

   * Information can be printed entirely or in parts

3. Integrated Packages

   * They follow the model of shuffling papers on your desktop

   * You don't have to change disks or application programs all the time

   * Information can be transferred easily from one program to the next

## Vocabulary

Data Base: In this context, it is an application program that sores a lot of information. You can store any kind of information (e.g., names and addresses of all students) and, with good programs, you can cross reference information. For example, if you wanted to find out which students had study hall second period, you could enter "study hall" and "second period" and those students' names would appear on the screen.

Filer Program: This is a specific find of data base. It is popular because it can keep files of information, as you would keep folders in a file cabinet. All of the material in each file is related to the main topic. The information can be searched for in a manner described in the definition above.

in the spreadsheet. You can pose an infinite number of these questions and make them as complex as you wish. However, it should be apparent that this kind of projecting is only as helpful as the information gathered. Inaccurate or incomplete data can lead to what people in computing refer to as "garbage in, garbage out."

Most electronic spreadsheets make it easy to format a document. The widths of columns can be adjusted according to the length of items to be entered. This feature is very convenient when words rather than numbers are inserted in the columns. With some programs you can copy formulas or data by using just one key, which saves a lot of retyping. Finally, documents can be printed in their entirety or in parts. For those of you who spend too much time with pads of yellow paper, pencils, and hand calculators, electronic spreadsheets are the answer.

3. Integrated Packages.

If you are still purchasing word processors, electronic spreadsheets, and/or filer programs, you should consider integrated packages. Only recently developed, they follow the model of shuffling papers on a desktop. Good examples of these types of programs are Lisa (Apple Computer Inc.), Visi (Visicorp), and Plan (Chang Laboratories). Just as you would move papers from one pile to the next, these integrated programs transfer information to different types of programs in the computer's memory. There is a great benefit to all of this. When you write a report, you no longer need to create information of one kind (e.g., a spreadsheet), store or print it, and then load another program (e.g., a word processor) to finish your work.

Let's suppose that you're writing a personal letter to 35 PTA members about your reading program and how it improved the school's reading scores on the Iowa test last spring. You have a filer or data base in which you've

3. Integrated Packages (continued)

* Two types of integrated packages exist

1) all of the programs are loaded at once
2) only the results are passed from one program to the next

## Vocabulary

Menus: These are very common on application programs. They are a list of choices or questions. The user simply selects the choice or answers the question, and the computer performs the operation. For example, in a word processor the menu may ask you to select the type of printer being used and the name of the document to be printed. With that information the computer will print your document.

stored individual student test scores for the past year. An integrated program will let you transfer this information to an electronic spreadsheet where percentages and other statistical information can be calculated. Some of that information can then be passed on to a graphics program, allowing you to present it in pie charts or bar graphs. All of this analyzed and refined information can then be inserted into the PTA letter, which will be written on the word processor. Names and addresses of each PTA member are drawn from another file in the data base, thus allowing automatic addressing of each letter. That's a lot of work to be done at once. In the past that would have taken a principal and a secretary three to five days to put together.

There are two types of integrated packages that should interest school administrators. The first allows you to load different programs into the computer's memory at the same time and move easily from one to the other. Usually these programs share the same commands, which means fewer commands for the user to remember. The software for Apple's Lisa is a good example of this. By using graphic images (icons) and elaborate screen menus, the user switches to different programs with ease. A spreadsheet, a word processor, and a graphics program all reside in the computer's memory at once.

The other type of integration is less sophisticated. Here, the results of one program can be passed to another for further use. Microsoft's Multiplan, File, Chart, and Word are good examples of this level of integration. A form letter to selected parents can be written on a word processor, and addresses can be retrieved from a data base. Essentially, the different programs--the word processor and the data base--can be linked. Buying any word processor and any data base does not mean this "dialogue"

3. Integrated packages (continued)

* Before buying one, determine

  1) what kind of information you use
  2) who will use it
  3) in what form the information is to be used

* Not every problem requires an integrated package

* Integrated programs tend to be expensive

* They often require large memories

* Be sure to see a demonstration before you buy one

C. Special Administrative Application Programs

1. Attendance Programs

* Will it take as much time on the computer as by hand?

* Teachers will still need to fill out forms and send them to the office

between programs can occur. Therefore, if you wish to integrate any application packages, it is absolutely necessary that they be compatible.

Before buying an integrated package, you need to determine what kind of information you generally use, who needs the information, and in what form. Not every problem requires a complex level of integration. For example, a good word processor alone will permit you to do the form letter and addressing task just mentioned. Integrated programs are not only expensive, but require newer machines with 16-bit processors, large memories, and even hard disks. Buyers should also be skeptical of a manufacturer's claims. See a demonstration before you buy anything because many integrated packages are incomplete. Finally, no integrated programs for the school administrator--programs for attendance, scheduling, transcripts, etc.--have been written for the general market to date.

## C. Special Administrative Application Programs

### 1. Attendance Programs.

When you look at attendance programs, ask yourself whether it will take as much time to do the work on the computer as it would by hand. Although many packages may be advertised as immense time savers, this is not always the case. A clear example of this is the period-by-period attendance program.

With all systems, teachers will have to fill out forms and send them to the office. Requiring a clerk or a secretary to enter absence data on a period-by-period basis is very time consuming--hardly any more efficient than doing the job by hand. An unusual way to solve this problem is to have teachers fill out attendance on "bubble sheets," which are later recorded by scan readers. Although it is possible for a school to do this, it is not a

1. Attendance Programs (continued)

* Consider doing them only once or twice a day

* The program can list names of those

  1) present
  2) absent with excuses
  3) absent without excuses

* A good program can also

  1) enter this information into a student's file automatically
  2) print letters to parents

* More expensive systems allow searches for information

* Most require a microcomputer and two disk drives (recommended)

* Some large ones require hard disks

## Vocabulary

48K or 64K: The K following the numbers denotes a memory size. As an abbreviation for the metric term Kilo, it indicates the amount of kilobytes of memory a computer has. Bytes are a unit of storage. One letter, for example, may be stored in one byte. 48K would mean about 48,000 kilobytes.

Hard Disk: A type of disk drive that often attaches to the computer. Unlike an ordinary disk drive, it stores much more information and, consequently, it is much more expensive.

common practice. Thus, many attendance programs only help when the job is done once or, at most, twice a day. Let's assume attendance is reported once a day as we look at the typical attendance package.

Once a clerk has a list of absent students, he or she can enter it into the program along with other daily information (e.g. class lists, students with excused absences). The system can sort students' names and then (if desired) list those present, those with excused absences, and those absent without excuse. More sophisticated systems transfer this information to a data base, thus integrating it into a student's attendance record. These systems may even include a limited word processor that will automatically print letters to parents. The advantage of some of the more expensive systems is that the clerk merely enters all the student names (or identification numbers) and each one's attendance status. The computer automatically searches for each student's file and enters the appropriate data. This is far more efficient than calling up each file individually, entering the attendance status, saving the file, and calling up the next one.

For most attendance programs, a standard 48 or 64K microcomputer with two disk drives is required--one disk to hold the program itself and the other to hold student record information. With large schools, using a second disk drive can be a minor problem because one disk may not be able to store all of the student records. Thus, several floppy disks may be required. Changing disks is annoying and sometimes confusing. One way to avoid this problem is to use a hard disk, a special storage device that works like a regular disk drive but stores much more information. Although the price range for hard disks is usually $1500 and up, the volume of information and the convenience usually justifies the expense.

2. Scheduling programs

* These let you schedule classes quickly
* They are most beneficial when the scheduling is flexible
* They cross-reference classes where there is conflict
* Good ones allow for mass or block scheduling

2. Scheduling Programs.

These programs can be exceptional timesavers. In one day any administrator in charge of scheduling classes can do what would normally take a week or more. This claim assumes, however, that class schedules are flexible (i.e., more or fewer sections of a class might be offered, depending on student interest). Scheduling programs are not as much of a benefit to schools with inflexible schedules.

A typical scheduling program works like this. Once student requests for classes have been entered on the computer, the program shows how many students are interested in each course. The computer then cross-references these requests to show which courses conflict and which can be offered at the same time. Based on this information, the administrator can create a school schedule with a minimum of time conflicts. A good scheduling program will use this final master schedule to generate individual class schedules for each student.

Efficient scheduling programs allow for mass scheduling, where a group of students can be scheduled into the same class or classes. If all seniors have to be enrolled in a course on government, for example, this can be done all at once rather than entering that class for each senior. The hardware requirements for scheduling programs are usually the same as those for attendance packages. Again, for large schools, a hard disk is suggested.

3. IEP Management Programs.

These programs vary as much in complexity as they do in price. Simple Individualized Education Plan (IEP) managers cost as little as $100, but all they do is print a student's IEP, something an inexpensive word

3. IEP management programs

* These can be very expensive

* Price very much determines the range of capabilities

* The most expensive even coordinate reports at the state level

* Two common forms of IEP managers

    1) commercial programs that vary in price and flexibility
    2) "grassroots" developed within the district

        a) these tend to be less expensive
        b) they're generally very well suited to the job they perform

processor or filer program can perform just as well. At the other extreme, in the $6,000 to $8,000 range, there are programs that will help create objectives based solely on performance or criteria tests to be used with the student. Expensive systems can coordinate information from the school to the district and/or county, and even to the state. Such a system exists in Louisiana, allowing special education administrators to transfer IEPs automatically throughout the state. This system, however, was funded by the state--something that rarely occurs.

In addition to statewide networks like the one just described, there are two other common forms of IEP managers, commercial and "grassroots." Commercial programs can vary greatly in price and flexibility. Some can be modified, often with the assistance of a consultant, to fit specific district needs. For obvious reasons, tailoring these commercial IEP programs to the district is essential because generic IEPs are of little value to anyone. Therefore, the good IEP manager programs will often entail some kind of consulting, a cost not always included in the original price of the software.

More popular than the commercial programs are the "grassroots" programs. Sometimes a district receives a grant to develop its own kind of IEP manager. Either people who work for the district or outside consultants do the programming, often collaborating with district special education administrators in the design. There are two clear advantages to this approach: cost and suitability. By using district personnel to write all or part of the program, costs are reduced. Also, since it meets specific needs, the final product is well suited to the district.

Regardless of how an IEP manager is created or acquired, there are important criteria to follow, as you can see in this list.

3. IEP management programs (continued)

* SHOW TRANSPARENCY #8

* DISTRIBUTE HANDOUT #1

* The reactions to the programs have generally been positive

  1) time is saved
  2) objectives are better
  3) parents like their copies
  4) administrators get help with reports and timelines

* The negative comments center around the time it takes to learn them

SHOW TRANSPARENCY #8 & DISTRIBUTE HANDOUT #1.

The little that has been reported about IEP managers has usually been positive. The time saved on each file is anywhere from 20 minutes to two hours. Special educators tend to write better short- and long-term objectives, especially with those programs that allow the user to search for objectives by key words. In turn, more objectives tend to be selected and met largely because they are well defined. Parents like their copies of the IEPs because they are clear, well formatted, and readable. Finally, administrators like the program because it reduces paperwork and gives them a general picture of student progress with timelines for review, testing, reports, and so on. The more sophisticated systems even help administrators file reports with state departments of special education.

The recurrent complaint about some IEP managers involves the time it takes to learn them. In one Pittsburgh school district, teachers took as long as three years to learn and feel comfortable with the system. This was a particularly complex system, one that cross-referenced objectives with a preprogrammed list of district materials and teaching strategies. Just the same, if these systems are to be used by teachers as well as administrators, you will need to weigh inservice costs against overall time savings.

## D. Information Processing

### 1. Grade Book Programs.

These programs are inexpensive and usually provide options that go beyond just averaging scores.

SHOW TRANSPARENCY #9

15

D. Information Processing

1. Grade book programs

* SHOW TRANSPARENCY #9

* They will

1) average grades
2) alphabetize names of students in the class
3) assign grades
4) print class rankings

* Good ones will have report forms for

1) absences
2) student progress
3) class activities

2. Automated Scoring and Diagnostic Analysis

* Traditionally this has been associated with norm reference tests

* Now they're found on drill and practice programs and tutorial programs

* Programs will list

1) the number attempted
2) the number correct
3) the number of tries per item

* Fewer programs link performance to a review schedule

* Good programs allow students to branch

## Vocabulary

CAI: Computer-Assisted Instruction. This is a very common acronym, and it denotes a broad class of instructional programs. Generally, they include drill and practice, tutorials, and simulations. These different types of CAI are defined at length in section III.

A decent grade book program will do all the standard things: (1) alphabetize names of students in the class, (2) average a student's score for a term, (3) assign a grade, (4) print class rankings, and (5) calculate other simple distributions. Better grade book programs have report forms for absences, individual student progress, and class activities. These programs save time and allow the teacher to calculate the grade for any student at any time during the term.

2. Automated Scoring and Diagnostic Analysis.

For a long time automated scoring has been associated only with norm reference tests given each fall and spring. To save costs and time, lengthy tests such as these are best scored by a computer. Now the same automated scoring is available for CAI (Computer-Assisted Instruction) drill and practice programs and tutorials. The programs generally list the percent of items attempted, those answered correctly, and sometimes the number of tries per item. A few programs will link this scoring with a review process, although this is usually crude (i.e., the same missed items appear once again). Where this is not the case, similar items will appear that the student must answer correctly before continuing in the program. In this limited sense, the computer "diagnoses" a student's weaknesses and provides additional practice. Good tutorial programs pretest the student at the beginning of each instructional unit, thus allowing the student to move on to that information where teaching is necessary. This saves time and militates against boredom. Authoring languages and systems usually have these scoring and review procedures as standard features.

3. Group CAI

* One common concept of networking with students is a computer lab

* Computers are linked to a central disk drive

  1) you save on software
  2) you save on disk drives

* There are problems

  1) many popular microcomputers do not allow networking
  2) many of the popular software programs are not available
  3) most software is written with one machine in mind

* Teachers in computer labs report that networking is faster

## Vocabulary

Group CAI: Students all work on the same CAI program at the same time. This is different from one student at a computer doing one program, another student at another computer working on another program, etc. It is related to the concept of networking.

Networking: Linking computers together so that they are connected to one main computer. Also, using devices such as keypads to send information to a main computer where it is processed.

3. Group CAI (Computer-Assisted Instruction).

Group CAI means a lot more than 15 students at work in the school's computer lab; it involves various forms of networking. The potential benefit of group CAI is that it links many standard computer uses into one package. An entire class, for example, can do drill and practice seatwork that is automatically scored and recorded into a grade book program. The program, in turn, shows the teacher the items or areas on which the class is weak. Although this technology is still being developed, it promises much more than the common perception of computer-assisted instruction: that is, one or two individuals working in isolation at one computer.

Networking consists of a group of microcomputers all connected to the same central disk drive. A program loaded into the main drive runs on each computer. The cost benefit of this kind of networking is significant because the district can save on disk drives and on multiple copies of the same software. Of the schools in this country that use computers, from 15 to 30 percent use networking of some kind (Spain, 1984).

Yet in the attempt to make computer instruction more affordable, there are several problems. First, many of the popular microcomputers such as Apple and Commodore do not allow networking as a standard system feature. Second, most of the popular educational software programs are not available in network versions (Spain, 1984). Finally, most software programs are written with one machine in mind. For those programs that require the computer's memory to refer frequently to the program in the central disk drive, all kinds of disk access problems arise--especially long waiting times--when several micros are networked in the same disk drive.

This does not mean that networking only creates problems. Teachers consistently report that in a lab situation, networking is a lot faster than

3. Group CAI (continued)

* You don't need microcomputers to have networking

* With one micro, a disk drive, and polling devices you can

  1) have students enter independent seatwork answers
  2) they can receive feedback on their answers

* Teachers can ask questions during

  1) lectures
  2) slide, videotape, or film presentations

* This technology is still being developed

* DO ACTIVITY #2

* DISTRIBUTE HANDOUTS #2, #3, #4, and #5

15 students each loading floppy disks into their computers. The source of difficulties, it appears, is in the indiscriminant attempt to use any kind of software with networks. This can be avoided when the teacher uses software designed expressly for networks.

Microcomputers are not the only things that can be linked to a main disk drive; simple polling devices such as telephone keypads work just as well. Although this set-up limits responses to numeric or multiple choice formats, it is extremely inexpensive. All that is needed is one microcomputer, a disk drive, a keypad for each student, and the networking software. With this setup, a wide range of activities can occur.

Students can use this kind of networking while doing math worksheets independently at their desks. As they enter their answers, they can receive immediate feedback from a central monitor. The networking software can score student work and keep track of how many problems are answered correctly in the practice period--all while the teacher is doing other work.

Networking of this kind can be extended to more interactive settings. While lecturing or showing a film or a videotape, the teacher can halt all activities and quickly check for class understanding. Not only will this give the teacher more specific feedback on how well students comprehend the material, but this quick check will also increase the general level of on-task behavior.

It bears repeating to remind you that this kind of technology is still being developed. No doubt, it will be a fully workable form of instruction long before it is widely adopted as a common classroom practice.

DISTRIBUTE HANDOUTS #2 - #5

DO ACTIVITY #2

## III. Computer-Assisted Instruction

presentation time: one hour

## Manual Outline

### III. COMPUTER-ASSISTED INSTRUCTION

Page 19

A. Introduction

* This section presents information about drill & practice, tutorials, simulations, and instructional games.

B. Drill and Practice

* Most CAI programs are elementary school drill and practice.

* Drill and practice programs do not teach; they simply allow students to practice important skills.

### Vocabulary

CAI: An acronym for "computer-assisted instruction."

Drill and Practice Programs: A program designed to help the consolidation of specific skills.

## III. COMPUTER-ASSISTED INSTRUCTION

### A. Introduction

Although there are several ways to talk about computer-assisted instruction (CAI), it is impossible to limit the field to absolute categories. This is a discussion of the four most popular applications of computer-assisted instruction in elementary and secondary schools: (1) drill and practice, (2) tutorials, (3) simulations, and (4) instructional games.

### B. Drill and Practice

#### A Definition of Drill and Practice

Drill and practice programs, the first type of computer-assisted instruction, are quite popular with educators. In fact, a 1984 software survey conducted by Educational Products Information Exchange (EPIE) reported that the majority of educational software on the market is developed for drilling and practicing skills at the elementary level.

Drill and practice programs are designed to help students develop a specific skill they have already been taught by presenting a series of well-organized, self-correcting drills. These programs do not teach. Instead, they simply allow students to practice important skills. Basic skills information from mathematics and language arts, such as arithmetic

B. Drill and Practice (continued)

* SHOW TRANSPARENCY #10.

* Drill and practice programs frequently use response formats found in printed instructional materials.

* Some drill and practice programs resemble arcade games.

* SHOW TRANSPARENCY #11.

facts or vocabulary definitions, comprise the majority of the content presented in drill and practice software.

## Common Drill and Practice Designs

Typically, drill and practice programs present the student with problems or questions to be answered. The computer gives appropriate feedback to the answers the student enters on the keyboard.

SHOW TRANSPARENCY #10

Some common response formats for drill and practice programs are two-way choice alternatives, multiple choice questions, and fill-in-the-blank items.

Such response formats are also frequently used in printed instructional materials. When applied to computer programs, they may be creatively presented to remediate and reinforce important skills. In many instances, however, drill and practice programs simply resemble workbooks and fail to take advantage of the computer's unique capabilities, such as color, sound, and graphic design.

## Drill and Practice Program Examples

SHOW TRANSPARENCY #11

This is a screen display from ALIEN ADDITION, a drill and practice program published by Developmental Learning Materials (DLM). This program integrates the sound, color, and graphic effects presented in popular arcade games as a basis for motivating students to memorize basic arithmetic facts. The object of ALIEN ADDITION is to answer a problem correctly to "destroy"

B. Drill and Practice (continued)

* SHOW TRANSPARENCY #12.

* Drill and practice programs are sometimes criticized as being expensive flash cards.

* Some are montonous, and others may even reinforce incorrect learning.

* Drill and practice programs may also imply that all questions have only one correct answer.

an alien spaceship. The microcomputer continuously presents arithmetic problems to the student at timed intervals.

The program is based on the belief that students will be motivated to commit arithmetic facts to memory in order to respond fast enough to eliminate the alien spaceships. It automatically records a student's score, reports the results in an end-of-program summary, and includes printed practice materials for students to use off-computer.

## Criticisms of Drill and Practice

A number of critical comments have been directed at drill and practice programs.

SHOW TRANSPARENCY #12

One frequent concern is that microcomputer resources are too limited and too expensive to be used merely as automatic flash card machines. Poorly conceived drill and practice programs have been characterized as being monotonous or boring and, at times, have been even criticised for reinforcing incorrect learning. Another concern is that drill and practice programs may negatively influence instruction by reducing learning to a trivia game that implies all questions have only one correct answer.

## The Potential Value of Drill and Practice

Are drill and practice programs totally without merit? Are they a poor use of a powerful microcomputer?

SHOW TRANSPARENCY #13

B. Drill and Practice (continued)

* SHOW TRANSPARENCY #13.

* A modern view of learning accepts drill and practice as a necessary part of the learning process.

* Microcomputers are much better suited to the presentation of repetitious tasks.

* Research indicates that drill and practice CAI can be more effective than traditional instruction.

Most educators acknowledge that every content area does have a domain of important facts that students must learn. For this reason, a modern view of learning accepts drill and practice as a necessary part of the learning process. In addition, studies of conventional teacher-directed instruction report that the frequency of factual single-answer questions has a positive effect on gain in student achievement.

Using microcomputers to provide students with drill and practice can eliminate the potential drudgery of repetitious tasks for both teachers and learners. Drill and practice has traditionally been associated with print materials and the presence of a teacher. Yet preparing, presenting, and monitoring practice tasks for students often limits a teacher's opportunity to teach more complex skills and ideas. Microcomputers are much better suited to presenting repetitious tasks because they patiently respond to students.

## Research on Effectiveness

Computer-assisted instruction drill programs have been the subject of a number of studies that indicate they can be more effective than traditional instruction. For example, Becker (1982) reported that "major, systematic, well-monitored evaluations have found that computer-based drills can produce increased achievement in comparison to prior years or in comparison to control group treatments" (p. 19). Such results were found most often in mathematics instruction, less often in foreign language instruction. Forman (1982) also reported that drill and practice programs seem to be more effective for low-ability students than for middle- or high-ability students.

The bulk of these studies involved instruction provided by time-sharing terminals linked to large mainframe computers rather than the

B. Drill and Practice (continued)

* Most of the research has been conducted under circumstances that were inconsistent with a typical school environment.

C. Tutorial Computer-Assisted Instruction

* Tutorial programs attempt to introduce new information and concepts.

* Tutorial programs frequently use instructional design principals derived from programmed instruction.

## Vocabulary

| | |
|---|---|
| Tutorial Computer-Assisted Instruction: | A microcomputer program designed to tutor the user. |
| Programmed Instruction: | A design for presenting instruction that stresses an ordered sequence of instruction and learning in small increments. |

more typical drill and practice materials that are available for microcomputers. The subjects evaluated in most of these studies used a personal terminal, had a great deal of practice time, and were well monitored. Such a setting, however, is not consistent with the experience that most students receive in a typical school environment.

## C. Tutorial Computer-Assisted Instruction

### A Definition of a Tutorial

A second type of computer-assisted instruction program is the tutorial. In contrast to drill and practice programs, tutorial programs usually introduce new information and concepts to students. As the name implies, a tutorial program is designed to tutor the user, although most tutorial programs also include some elements of drill and practice.

Tutorial programs frequently use instructional design principles that were originally developed for programmed instruction. The term "instructional design" was developed by learning theorists to describe a systematic, model-based approach to creating instructional materials. Programmed instruction (PI) refers to a particular instructional design for presenting printed learning material. Common characteristics of programmed instruction include (1) an ordered sequence of instruction, (2) the presentation of information in small increments, (3) active student responses, (4) a narrow range of possible answers, and (5) provisions to reinforce correct responses and to inform learners about their progress.

### Common Tutorial Designs

There are two main kinds of instructional design that these programs typically follow--linear and branching.

C. Tutorial Computer-Assisted Instruction (continued)

* Two common instructional designs used in tutorial programs are linear and branching designs.
* SHOW TRANSPARENCY #14 -- TOP HALF
* SHOW TRANSPARENCY #14 -- BOTTOM HALF
* Tutorial programs are usually designed to accept a narrow range of responses.
* A few tutorial programs, sometimes referred to as intelligent computer-assisted instruction, more closely resemble human teacher-pupil interaction.
* SHOW TRANSPARENCY #15.
* SHOW TRANSPARENCY #16.
* WRITING A CHARACTER SKETCH is an example of a typical tutorial program for microcomupters

Vocabulary

| | |
|---|---|
| Linear Instructional Designs: | Instruction that progresses from one topic of instruction to another without deviating from a linear path. |
| Branching Instructional Designs: | Instruction that is laid out as a decision tree where the path taken by the learner depends on his/her response. |

SHOW TRANSPARENCY #14 - TOP

Many tutorial programs use a "linear instructional design," which requires learners to progress from one point of instruction to another without deviating from the linear path. For students to end an instructional unit or module in a linear tutorial program, they must successfully complete each task in sequential order.

SHOW TRANSPARENCY #14 - BOTTOM

An alternative design is a program that "branches." The pattern of instruction in these programs is called a "decision tree" because it resembles the branches of a tree. The path taken by the learner depends upon his or her response to questions at specific branch points. A branching program allows the learner to skip ahead to new information.

Tutorial programs usually accept a fairly narrow range of responses. But some more sophisticated programs developed for large main-frame computers can interact with learners in a dialogue that is based on their responses to specific questions. Here is an example of a dialogue between a computer (C) and a student (S).

SHOW TRANSPARENCY #15

SHOW TRANSPARENCY #16

This is a screen display from WRITING A CHARACTER SKETCH, a tutorial program published by the Minnesota Educational Computing Consortium. It is also an

C. Tutorial Computer-Assisted Instruction (continued)

* Intelligent computer-assisted instruction programs are very difficult to design.

* A tutorial programmer must anticipate all possible ways that a learner might respond to a program.

* SHOW TRANSPARENCY #17.

interactive program that guides students by examples and questions to think about how to characterize a person from fiction or history or their own experience.

Tutorial dialogues, such as the one we just saw (Transparency #15), are sometimes referred to as "intelligent computer-assisted instruction." The programs attempt to analyze how well learners understand material and provide instruction based on this analysis. Only a few intelligent computer-assisted instruction programs exist, primarily for use with main-frame computers. They do resemble human teacher-pupil interaction more closely, but are extremely difficult to design. Versions of these programs for microcomputers will not become commonplace until the systems that can run them become more affordable and a wider range of expertise and knowledge about intelligent computer-assisted instruction becomes available.

## Limitations of Tutorials

Tutorials have several limitations that make programming precise instructions difficult. According to studies of printed programmed materials, some students consider programmed instruction tedious and boring. A tutorial designer must anticipate all the possible ways a learner might respond to a question.

SHOW TRANSPARENCY #17

Deciding what constitutes a correct answer and how a tutorial will respond to errors requires extremely careful planning because there are four main classes of possible student answers that must be considered: (1) correct or synonymous; (2) literally correct but conceptually incorrect; (3) unanticipated but not necessarily incorrect; and (4) anticipated errors

C. Tutorial Computer-Assisted Instruction (continued)

* The effective use of CAI concerns using the computer as an adjunct to instruction.

* Research indicates that tutorial programs should be viewed as a resource within a teacher-directed classroom. Teachers should not relinquish instructional responsibility when tutorial programs are used.

that reflect mislearning.

It is also difficult to design tutorial instruction for content that does not readily conform to rules or procedures. For example, it is not possible to specify rules for writing a paragraph with a main idea and appropriate supporting details so that a computer can judge whether a student has written a well-structured paragraph or nonsense.

In the conventionl learning environment, the teacher can respond to students' questions and problems in a variety of ways. In contrast, a microcomputer tutorial program cannot improvise judgments on unanticipated answers, even though students rarely respond to instruction in completely predictable ways.

## Research on Effectiveness

Should the rate, sequence, and content of instruction be prescribed by the student or the tutorial program? Research on the effectiveness of tutorial computer-assisted instruction, which has frequently been concerned with this issue, indicates a compromise is preferred where either the student or the program may control the course of learning at appropriate times (Kearsley, Hunter, and Seidel, 1983).

In addition, Forman (1982) observed that "the bulk of the studies showing computer-assisted instruction to be effective have concerned the use of adjunct computer-assisted instruction in which the classroom teacher was readily available" (p. 38). This observation, coupled with information on instructional control, suggests that tutorial programs should be viewed as a resource within a teacher-directed classroom.

Teachers do not relinquish their instructional responsibility when tutorial programs are used because successful implementation of such programs is predicated on their active participation. Two major

C. Tutorial Computer-Assisted Instruction (continued)

* Tutorial-using teachers must carefully evaluate and select programs that match the learner's needs.

* Tutorial-using teachers must monitor and assist students before, during, and after involvement with a tutorial.

D. Simulation-Oriented Computer-Assisted Instruction

* Simulations imitate an abstract or real-life situation or process.

* There are various types of simulations.

* Procedure simulations allow students to practice a dangerous or expensive procedure.

* Information retrieval simulations are used to let students practice decision making.

## Vocabulary

Simulation: A program that imitates an abstract or real-life situation or process.

responsibilities of those teachers using tutorial are (1) to evaluate and select programs that match learners' needs and (2) to provide instruction and assistance to learners before, during, and after they use a tutorial program.

## D. Simulation-Oriented Computer-Assisted Instruction

### A Definition of a Simulation

The third type of computer-assisted instruction is a simulation, which imitates an abstract or real-life situation or process. Participants in a simulation usually play a role that requires them to interact with other people or with elements of the simulated environment. Simulations frequently rely on a game-like format to help produce a relaxed atmosphere that is conducive to learning.

### Common Simulation Designs

The design of a microcomputer simulation is a complex task that requires hundreds of hours of planning and programming. Three designs are commonly used for educational simulations: procedure, information retrieval, and encounter.

Procedure Simulations: Some instructional goals require students to become proficient at performing procedures that are potentially dangerous or expensive, such as landing an airplane safely, correctly diagnosing an illness, and prescribing appropriate medical treatment. Procedure simulations allow students to practice these important skills without tremendous expense or the loss of lives.

Information Retrieval Simulations: The goal of an information retrieval simulation is to obtain information. This type of simulation

D. Simulation-Oriented Computer-Assisted Instruction (continued)

* Encounter simulations are concerned with phenomena that are difficult to predict or define.

* Simulations frequently begin by presenting an opening scenario.

* SHOW TRANSPARENCY #18.

frequently has no clear task or performance goal for learners other than to learn how to predict the consequences of some action. Its design has been applied to programs that allow learners to obtain information on and test out ideas about a simulated environment such as an economic or ecological system.

Encounter Simulations: Encounter simulations are concerned with phenomena that are unpredictable or difficult to define. The purpose of the simulation is to experience achieving a goal in a setting that has no clearly defined procedures or principles to follow. Examples of this category are role playing activities that simulate situations such as a teacher's first year in teaching or a business competition. Because there are few cause and effect relationships to be discovered in an encounter simulation, a direct transfer of learning may not happen.

Simulation Program Example

An important attribute of many simulation designs is the opening scene or scenario. This part of the simulation describes the objectives of the simulation, the goal of the participant, rules, time limitations, and related resources.

SHOW TRANSPARENCY #18

Here is a screen display from the opening scenario of OH, DEER! a scientific information retrieval simulation published by the Minnesota Educational Computing Consortium (MECC). Students in grades 5 to 9 learn about wildlife population dynamics and management issues by controlling the size of a hungry deer herd.

D. Simulation-Oriented Computer-Assisted Instruction (continued)

* A limitation of simulations is their dependence on the discovery learning method.

* Simulations can be used to study events that might not be possible to examine in real life.

## Limitations of Simulations

As with all instructional materials, simulations have limitations as well as strengths. One limitation is a dependence on the discovery method of learning, which involves creating conditions whereby learners can reach insights on their own. Discovery learning via computer simulations frequently depends on a student's ability to read and interpret information. This can be a real handicap for students with limited reading and spelling skills.

The use of simulations frequently requires putting students together in pairs or small groups. While such grouping arrangements promote social interaction between students, some learners are not able to exercise the self-discipline and responsibility necessary to be successful in self-directed instruction. Minor chaos can be the result.

Dennis (1979) observed that "learning from a simulation is predicated on interaction with it. A simulation does not present information to the student. Rather it surrenders it as a consequence of student interaction" (p. 7). Because discovery learning is more time-consuming than traditional teacher-directed instruction, simulations frequently require more opportunities for interaction than currently exist in the schools. An idea that might be stated in a single sentence could require an hour of interaction to understand through a computer simulation. A teacher must decide if the simulation learning experience is worth the time.

## Potential Value of Simulations

Simulations can also be valuable ways to study events--particularly in science and social studies--that cannot be examined in real life due to

D. Simulation-Oriented Computer-Assisted Instruction (continued)

* Determining the value of a simulation depends on the teacher's instructional goals.

* Unlike most computer programs, simulations can be used with an entire classroom of students.

* Research on simulations has been primarily limited to non-computer-based simulations.

expense, difficult logistics, danger, or lack of time. Determining the value of a simulation depends on the teacher's instructional goals. If the goal of instruction is to learn new skills as expediently as possible, then computer simulations are not the most effective vehicle. However, if the goals of instruction are to develop decision-making skills, personal interaction skills, and the ability to discover cause-and-effect relationships, then simulations can be useful instructional tools.

Unlike most computer-assisted instructional programs, simulations are not limited to one-on-one interaction with a student. This is particularly beneficial for schools with a limited number of computers because many simulation programs can be used with decision-making teams of students or even with an entire classroom.

### Research On Effectiveness

At present, research on the instructional effectiveness of simulation is limited because it has primarily focused on non-computer-based simulations. Greenblat (1981) summarized the status of simulation research by saying:

> It appears that there is a considerable amount of anecdotal material about the affective involvement of students at the time of participation, and some evidence that student interest in simulations is very high. There is, at the moment, little hard data to show that such participation leads to greater interest in the subject matter, the course, or learning in general (p. 149).

## E. Instructional Games

### A Definition of Instructional Games

The final popular application of computer-assisted instruction is instructional games. An instructional game is an activity in which players

E. Instructional Games

* An instructional game may include elements of drill and practice, tutorial, and simulation computer-assisted instruction.

* It is often hard to determine if a game is instructional because the instructional aspects are masked by the game itself.

* SHOW TRANSPARENCY #19.

* SHOW TRANSPARENCY #20.

develop particular skills by trying to attain a goal within prescribed rules. These games may include elements of drill and practice, tutorial, and simulated computer-assisted instruction. They can provide an attractive framework for learning activities and offer students a welcome break from the day-to-day classroom routine.

## Common Instructional Game Designs

Many computer games are simply traditional instructional games, such as hangman or tic-tac-toe, that have been transferred to a computer. Other kinds of games have an instructional objective "embedded" in their design. Because many of the games are intended to be fun as well as educational, the embedding is sometimes so deep that it is hard to determine if a game really is instructional.

There are many different types of game designs.

SHOW TRANSPARENCY #19

David Ahl (1973), in fact, has identified twelve different categories of computer games: (1) guessing, (2) piles of objects, (3) matrix, (4) history/government, (5) sports, (6) logic/strategy, (7) gambling, (8) card and board, (9) war, (10) space, (11) word, and (12) data games.

## Instructional Game Program Example

SHOW TRANSPARENCY #20

Here is a screen display from MASTERY TYPE, an instructional game published by Scarborough Systems. MASTERTYPE presents information about touch typing

E. Instructional Games (continued)

* Computer games have been criticized as being too violent or too dependent upon a learner's eye-hand coordination.

* SHOW TRANSPARENCY #21.

in a series of sequential activities. The program drills the students in various typing tasks by using an arcade game format. The student is a planetary defender fighting the deadly invaders from the planet "Lexico." Letters or words in each corner of the screen represent invaders that launch missiles at the defender's planet, located in the middle of the screen. The defender can destroy the approaching missiles by typing the appropriate letters or words correctly on the computer's keyboard.

## Criticisms of Instructional Games

Is there a difference between an instructional game and a recreational game? Some educators facetiously reply that the only difference between the two is that a recreational game is fun, while an instructional game is not. Instructional computer games have been criticized because some teachers lapse into using them as babysitters. Moreover, many computer games have violent or competitive themes that are unacceptable to those educators who believe that the pseudo-destruction of people or planets may have a negative influence on students.

Computer games have also been criticized because they frequently require a learner to be adept at quickly locating and pressing keys on a computer keyboard to answer a question correctly. Rapidly pressing keys may be an extremely difficult task for a younger child or a physically handicapped student. Games that require a high-response rate from the user may actually be testing and promoting motor skills rather than instructional skills.

## Potential Value of Instructional Games

SHOW TRANSPARENCY #21

E. Instructional Games (continued)

* Games are well suited to instructional objectives that involve recognition, discrimination, or drill.

* Game programs have the potential to motivate students to practice important academic skills.

* Very little research has been conducted regarding the instructional effectiveness of computer games.

  -- may stimulate mentally ill

  -- may motivate reluctant learners

  -- three characteristics: challenge, fantasy, curiosity

* No clear answers yet.

Instructional games are particularly well suited to recognition and differentiation of items or repetitive drills. Game programs have the potential to motivate students to practice important skills that they might otherwise regard as tedious or boring.

Some experts believe that even non-instructional video games have redeeming instructional qualities because they teach spatial visualization and eye-hand coordination. Instructional games also (a) enable a player to experience success while mastering a new situation or skill and (b) illustrate important computer processes for a student.

## Research on Effectiveness

Although instructional games have been and will continue to be a popular approach to learning with a microcomputer, very little research has been conducted on their instructional effectiveness. Researchers have been more interested in investigating non-instructional video games. Preliminary research findings do indicate that video games may help stimulate the chronically mentally ill and motivate reluctant learners.

Dr. Thomas Malone (Kelman et al., 1983) has identified three characteristics of computer games that make them highly motivating for students: challenge, fantasy, and curiosity. However, there are no clear theories about which aspects of games promote learning or how they affect students. Until these questions are carefully researched, reports on the instructional effectiveness of computer games will continue either to present ambiguous conclusions or to be simply testimonials of enthusiastic teachers.

Summary on CAI Programs

* The field of CAI is still in its infancy.

* Until more research becomes available, schools should use computers mainly as an adjunct to instruction.

F. Word Processing

* It is essentially a computer program that allows the writer to type a document and view the results.

* SHOW TRANSPARENCY #22.

Summary on CAI Programs

In summary, educators who use computer-assisted instruction programs should realize that the field is still in its infancy. Many unresolved questions remain about the instructional potential of computer-assisted instruction for microcomputers. It would be a shame if the use of computers in education were predicated on evaluations such as "The kids love it; we can tell just by watching them that they are really learning." Until the research is more specific, it seems reasonable that schools should concentrate on using computers as an adjunct to instruction with a teacher present to direct and assist students.

## F. Word Processing

A Definition of Word Processing

One final kind of computer program that is frequently used in the classroom is a word processor. Instead of teaching particular writing skills, a word processor is an aid to writing instruction that allows students to type a document and view it on a monitor. With a word processor, writers can add or delete text, insert a word or a line, and rearrange text without retyping the entire composition.

Word Processing Program Example

SHOW TRANSPARENCY #22

Here is a screen display from the BANK STREET WRITER, a word processing program published by Scholastic Software. Many computer education experts consider this program as exemplary because it has a limited number of

F. Word Processing (continued)

* Reports on word processing are generally positive, but most are case studies, not experimental research.

* There are still important questions to be asked.

* SHOW TRANSPARENCY #23.

* DO ACTIVITY #3

commands student writers need to remember and it prompts writers with messages that appear on the screen.

## Research on Word Processing

A number of researchers and teachers are interested in the use of word processing as an aid to writing instruction. Reports about the use of word processing with students of all ages are consistently positive, although they primarily consist of case studies rather than experimental research.

A review of the literature indicates that research about word processing and writing instruction is limited. There is no lack of opinion about the subject, however.

SHOW TRANSPARENCY #23

A summary of some commonly held opinions about the use of word processing in composition instruction includes (1) not focusing on drills and exercises on mechanics, (2) providing instruction in keyboarding, (3) using a process approach to teaching writing, (4) emphasizing important steps in the writing process in the software, and (5) having a word processing program with a limited number of commands.

DO ACTIVITY #3

## IV. Video Disk Instruction

presentation time: 30 minutes

## Manual Outline

## IV. VIDEO DISK INSTRUCTION

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Capabilities of Video Disk:

* SLIDES--54,000 still frames on one side of a disk.
* MOVIE--30 minutes of motion sequence on each disk.
* FREEZE FRAME--holds a single frame for long periods of time, slow motion.
* RANDOM ACCESS--move to any specific location on the disk within a few seconds.

### Vocabulary

VIDEO DISK: Pictures are stored on a disk the size of a record album. Pictures can be displayed singly or rapidly to create motion sequences.

## IV. VIDEO DISK INSTRUCTION

by Douglas Carnine
Siegfied Engelmann
Alan Hofmeister

One of the most potent and versatile technologies currently available to educators is the video disk. One side of a laser disk can project 54,000 different still frame screens, making it the world's most efficient slide projector. If the frames are presented quickly, motion sequences are also possible. The teacher can play the disk forward and backward at different speeds, freeze the action for a moment to make a comment, or leave the image on the screen for an entire class period. If several different portions of the disk are needed for class discussion, the disk player can jump to them in a few seconds. This ability to jump quickly from place to place is called "random access," something that takes more time with a video tape player.

The potential of video disk instruction is limited only by the dynamics of the video sequences (Morris 1984), the simplicity and power of the instructional content (O'Loughlin and White, 1982), and the presence of a mastery learning management plan (Block, 1971). A well conceived and well executed video disk instructional system would both motivate students and increase their understanding and mastery of the subject-area content (Bunderson, Ballio, and Olsen, 1984). Video disk instruction can include drill and practice, tutorials, and simulations.

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A. Prevalence of Video Disk Players

* Players aren't common because they're typically hooked to a computer and used with individual students.

* Video disk lessons can be presented to an entire class, making video disk technology much more cost effective.

* Components of effective video disk instruction:

  Dynamic Video Sequences

  Instructional Design

  Mastery Learning

* Core Concepts is a series of math and science courses that integrate video, instructional design, and mastery learning for teaching an entire class.

## A. Prevalence of Video Disk Technology

For all the advantages of the video disk, the technology is only slowly beginning to appear in schools because of stereotypes about how the technology can be used. Most educators think the only way to use a disk player is to hook it up to a single computer and provide instruction for one user at a time. Such limited access makes video disk technology too expensive for widespread public school adoption. Most schools cannot afford the hardware and software for video disks if only a few students can use the system each day.

However, breaking the stereotype that disk players must be hooked to a single computer and used with one student at a time makes disk technology affordable. Presenting video disk instruction to an entire classroom, so that 25 or more students at a time benefit from the disk technology, is cost-effective. Moreover, because the teacher decides when to review or to elaborate information presented on the disk, he or she maintains the central role in the instructional process. Using a videoplayer to instruct an entire class makes it feasible for a teacher to use a video disk course as a primary means of presenting course content.

One example of the potential use of video disk technology is a system now under development called Core Concepts, which brings together video disk technology, instructional design, and mastery learning procedures for math and science instruction in high schools and colleges. Math and science teachers are very aware of the trade-offs between "finishing the book" and making sure the students have a basic understanding of the central concept of a course. The growing number of textbooks over the last five years makes compromise all the more difficult. The appeal of video disk instruction in Core Concepts is that it can easily illustrate key ideas and

B. Dynamic Video

* Video sequences can slow steps in a process, highlight key activities, and integrate explanations with application exercises.

C. Instructional Design

* Economy is achieved through simple explanations of key concepts.
* Power in instructional design occurs when a key concept is used to account for a variety of applications.
* Economy and power lead to highly useful, yet manageable chunks of learning.
* SHOW TRANSPARENCY #24.
* An example of economy is the explanation for the key scientific concept of generating and restoring forces in Transparency #24.

concepts through dynamic sequences of visual images.

## B. Dynamic Video

The advantages of dynamic video sequences are obvious. A textbook diagram of RNA's role in assembling proteins cannot convey the process as clearly as would a video sequence of the process in operation. Video can also highlight crucial events, like inclusion of the wrong amino acid in an RNA chain. The integration of video and audio--in the form of the teacher's explanations or questions while phenomena are being shown--makes possible realistic instruction through the disk medium.

## C. Instructional Design

The dynamics of video allow concepts to be conveyed in a relatively simple fashion. The notion of economy and power in instructional design came from Bruner's Toward a Theory of Instruction (1966). Economy comes in the simplicity of an analysis for portraying knowledge. Power refers to the generalizability of an analysis, the degree to which the analysis applies to many different examples. Economy and power are important because they provide a lens for transforming the growing information in science into more manageable chunks that are relatively easy to understand and that have great explanatory power.

An example from the Core Concepts physical science program is of harmonic motion. Students are first taught about generating and restoring forces in a pendulum.

SHOW TRANSPARENCY #24

C. Instructional Design (continued)

* SHOW TRANSPARENCY #25.

* Power is illustrated in Transparency #25, with various applications of key scientific concept of generating and restoring forces. Each new application of a key concept also serves to review the key concept.

A generating force, such as a push, sets the pendulum in motion from position B. As the pendulum rises, a restoring force--gravity--slows the pendulum and momentarily stops it at position A. The pendulum then falls back, overshooting its starting point at position B, and rises on the other side, stopping at position C. The cycle then repeats itself--the pendulum falls back, overshoots, rises, stops, falls back, overshoots, and so on. In short, the pendulum forms a system to which energy is added by a generating force and then transformed by a restoring force.

This explanation of the operation of a pendulum can be easily illustrated with a video disk, particularly with freeze frames and slow motion.

SHOW TRANSPARENCY #25

Once established through a simple illustration of a pendulum's motion, harmonic motion, with its generating force and restoring force, is then used to explain water waves, electricity, and cloud movements. Using a single, relatively simple model for harmonic motion helps students come to understand a core concept underlying the seemingly unrelated phenomena of water waves, electricity, and cloud movement.

The power in such an instructional design not only shows relationships among seemingly different topics, but also allows review of core concepts. Each time they are applied to a new example, these concepts are also reviewed. Thus, the video disks can contribute to both generalization and retention of important course materials.

## D. Mastery Learning Procedures

Dynamic video and well-designed instructional sequences alone will

D. Mastery Learning

* A mastery learning management system is an important component of a video disk instructional program.

* Video disks are well suited to mastery leaning.

  -- When students have difficulty with a skill, the teacher can have the disk jump about instantly to an appropriate teaching segment. Otherwise, the teacher continues with the lesson.

  -- Diagnostic test items can be presented as still frame problems on the screen. Practice problems can also be presented one at a time, followed by screens showing how answers are derived.

* SHOW TRANSPARENCY #26.

* Video disk instructional programs like Core Concepts have several checkpoints for mastery:

  1. After each new instructional segment.
     These practice problems serve as an immediate check.

  2. Before the beginning of the next lesson.
     This brief quiz is a one-day delay check.

  3. After every fourth lesson.
     This mastery test is a one-week delay check.

  4. At the end of each grading period.
     This exam is a multi-week delay check.

not ensure that the full range of students in secondary and post-secondary classrooms will learn adequately. Therefore, the Core Concepts course has numerous checkpoints for evaluating how well students are learning. At each checkpoint, the teacher decides whether enough students are responding acceptably to test items. If the teacher deems class performance to be satisfactory, he or she presents the next new segment on the disk. If performance is unsatisfactory, the teacher can replay an instructional segment from an earlier disk lesson and then give practice problems, shown as still frames on the screen. After students work through the problem, a screen showing the steps for working the problem is presented. The teacher presents problems one at a time until reaching the next checkpoint. Depending on how students perform, the teacher either proceeds with the lesson or replays another instructional segment from the disk.

SHOW TRANSPARENCY #26

Checkpoints occur at four stages:

1. After each new instructional segment from a lesson. These practice problems serve as an immediate check.
2. Before the beginning of the next lesson. This brief quiz is a one-day delay check.
3. After every fourth lesson. This mastery test is a one-week delay check.
4. At the end of each grading period. This exam is a multi-week delay check.

Immediate checks reveal how well initial learning is progressing. Teachers can quickly review troublesome material before initial confusions grow unwieldy. Delayed checks measure retention. Having checkpoints at various intervals allows teachers to quickly review skills before serious misconceptions develop. In classes with a wide range of abilities, the mastery learning system gives feedback a teacher needs to decide how much

E. Benefits of Video Disk Programs to Administrators

The features of well designed vido disk programs like Core Concepts not only improve student learning but also can help with staff development, serving as a model of effective teaching practices.

1. The clarity and motivating capacity of dynamic video.

2. The simplicity and power of the instructional design.

3. The mastery learning procedures.

additional explaining and practice students need. This feedback does not eliminate the problems caused by students with heterogenous skills, but it does allow teachers to react efficiently and effectively to students' errors.

## E. Benefits to Administrators

Three primary benefits of a video disk instructional system like Core Concepts have already been discussed:

1. The clarity and motivating capacity of dynamic video.
2. The simplicity and power of the instructional design.
3. The mastery learning procedures.

Some of the capabilities of Core Concepts are particularly relevant to a major administrator concern--staff development. In school districts where, for one reason or another, finding qualified math and science teachers is particularly difficult, the Core Concepts system offers a way to ensure that students receive high quality instruction. In classrooms with qualified instructors, the Core Concepts system can provide vivid, compelling visuals upon which experienced teachers can build their classroom presentations. In all situations, the full course video disk system could provide a model of important aspects of instructional design and of mastery learning that would be informative for most teachers. Finally, the frequent checkpoints in the mastery learning procedure also make it relatively easy for administrators to gauge the progress of students in classes taught by reassigned teachers or by any group of teachers, for that matter.

## V. Programming Languages

presentation time: 30 minutes

## Manual Outline

## V. PROGRAMMING LANGUAGES

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### Introduction to Programming Languages

* Many think that programming languages should be a part of instruction.
* The choice between BASIC and Pascal is a hot debate.

### A. BASIC

* Developed to let people with little or no programming run a computer.
* There are over 50 variations of the language.

## V. PROGRAMMING LANGUAGES

Computer programs are instructions that tell the computer the sequence of steps it must follow to execute a specific task. A complete set of programming instructions is referred to as a programming language. There are a number of programming languages designed for specific objectives, among them BASIC, Pascal, and LOGO--the three most widely used in schools.

Most computer educators agree that learning a computer language should be a fundamental part of the secondary school curriculum. But which language should be taught? And, who should learn this language? For years computer educators have vigorously debated the answers to these questions without reaching a consensus. A middle course of action now seems possible. But first, let's review the arguments surrounding the two main programming languages, BASIC and Pascal, and then consider LOGO, a language designed for younger children.

### A. BASIC

As one of the first computer languages, BASIC, or Beginners All-purpose Symbolic Instruction Code, was developed in the early 1960's with a simple goal: namely, to give people with no prior computing experience the ability to program a computer. It has been immensely successful in achieving this goal, to the point that there are now over 50 variations of BASIC. All popular microcomputers, for example, have their own versions of BASIC as a standard feature. Pascal, on the other hand, is usually sold as a separate software package.

A. BASIC (continued)

* Some computer scientists think it ruins the mind.

* SHOW TRANSPARENCY #27 - TOP THIRD

* A way to judge programs:

  1) explicitness
  2) coherence
  3) modularity
  4) versatility
  5) readability

* SHOW TRANSPARENCY #28 - TOP HALF.

* BASIC tends to be interrupted all the time by GOTOs and GOSUBs .

Usually many versions of BASIC aren't a problem for the casual user, although BASIC programs written for one brand of machines cannot be directly copied into another without detailed alterations. Nevertheless, of the secondary schools in this country that provide extensive computer programming instruction, 98 percent teach BASIC (Becker, 1983).

Yet among some computing circles, there is a general disdain for BASIC (Garland, 1984). The influential computer scientist Edsger Dijkstra has claimed that "it is practically impossible to teach good programming to students that have had a prior exposure to BASIC: as potential programmers they are mentally mutilated beyond hope of regeneration" (Dijkstra in Garland, 1984, p. 39). To understand Dijkstra's comment we must look at how BASIC can be used and misused.

SHOW TRANSPARENCY #27 - TOP THIRD

A programming language is a way to communicate with a computer. Unfortunately, computer programs can be awkward and even ambiguous. As software engineer Scott Anderson writes,

> To help avoid these pitfalls, programming languages should be judged by their explicitness, coherence, modularity, versatility and readability (Anderson, 1982, p. 21).

BASIC programs can meet some of these criteria, but too often they fall short.

SHOW TRANSPARENCY #28 - TOP HALF

Consider this program. Although it "works," the program is hardly very explicit or readable. The flow of the program is interrupted by the GOTOs and GOSUBs. Such commands are essential to the BASIC language, but they often create great confusion, especially when some part of a program needs

A. BASIC (continued)

* Structured BASIC is a partial answer to this.

B. Pascal

* Advantages of the language.

  1) it is widely taught at the university level
  2) it has been recommended by an ACM committee
  3) it is the language used on the Advanced Placement test

* An introduction to computing should teach computing concepts.

to be changed or corrected (debugged). BASIC programs can and should be written much more clearly. There is even a version of BASIC, "Structured BASIC," that lends itself to the criteria described by Anderson. Further, the use of shortcuts (e.g., little documentation in a program, the lack of clear divisons or modules, casual use of commands such as GOTOs and GOSUBs) tends to be the rule with most programmers. In the end, these teach students bad programming habits.

## B. Pascal

Those who argue for a more structured approach to computer programming favor Pascal as the programming language for secondary students for several reasons. First, because Pascal is widely taught at the college level and is used increasingly in industry, it is in keeping with the effort to transfer first year university courses to the secondary school level (Rogers, 1984). Second, it has been recommended by the Elementary and Secondary Schools Subcommittee of the Association for Computing Machinery (ACM) as the appropriate language for the student seriously interested in computer science. Third, Pascal is the language used on the College Entrance Examination Board's Advanced Placement exam.

The appeal of Pascal goes well beyond these pragmatic reasons. Computer scientist Olivier Lecarme (1984) argues that a first course in programming should teach programming, not a particular language. With this in mind, the chosen language should allow students to learn basic computer science concepts and methods. The language should be one with clear structure and readability, an efficient means of storing data, and well established methods or algorithms.

SHOW TRANSPARENCY #28 - BOTTOM HALF

B. Pacal (continued)

* SHOW TRANSPARENCY #28 - BOTTOM HALF
* A computer language should have a clear structure and be readable.
* Pascal has these features.
* REPEAT TRANSPARENCY #27 - ALL

Recommendations - BASIC or Pascal

* BASIC can be taught to those who want a general introduction.
* BASIC would be for computer literacy.
* Pascal would be for the more advanced students.

Some of this can be seen in our example of a Pascal program. For example, the functions of various parts of the program are made more explicit by the ability to name variables in Pascal. The program is clearly broken into blocks or modules, which aid in initial problem solving and eventual program clarity. Finally, as Anderson (1982) states, "Readability is Pascal's greatest asset. And, although it is possible to have poorly written programs in any language, Pascal's constructs encourage well written programs and sound programming methods" (p. 29).

SHOW TRANSPARENCY #27 - ALL

Recommendations - Basic or Pacal? Should BASIC be dropped from the secondary curriculum? Not necessarily. Following the ACM Education Board's guidelines, Structured BASIC can be taught to students who want a general introduction to computing. In this sense, BASIC satisfies one component of computer literacy, allowing the student to control the computer directly and use it as a tool. Pascal, then, would be reserved for the more advanced computer science students who wish to prepare for later university studies. The ACM Board has outlined a two-year sequence that would cover one year of university coursework for which Pascal is highly recommended as the chosen language. In this manner, both languages can be taught at the secondary level.

## C. Logo

Logo is a programming language designed for instructional purposes, specifically with children. It is a general purpose language created by a team of scientists and educators led by Dr. Seymour Paperi at Massachusetts

C. Logo

* For instructional purposes with younger children.
* The TURTLE GRAPHICS is well known.
* SHOW TRANSPARENCY #29.
* Graphic images are constructed by instructions to the computer--a small program.
* SHOW TRANSPARENCY #30.

Institute of Technology.

Logo Programming Example. In TURTLE GRAPHICS, the most well-known aspect of the Logo language, the cursor is used to represent a "turtle" on the screen. The student-programmer creates graphics by typing instructions that move the turtle and leave a trail of lines. For example, by using the Logo command statements "FORWARD" and "RIGHT," a student can program the turtle to draw a triangle on a monitor. Here is what the set of instructions might look like.

SHOW TRANSPARENCY #29

Once the procedure for drawing a triangle has been defined, the student does not have to retype repeatedly the eight commands that formed the original triangle. All the student has to do is enter the word TRIANGLE to draw a picture of a triangle.

SHOW TRANSPARENCY #30

Here is a screen display of a graphic created with Logo. The picture was drawn using the procedure for drawing a triangle that we just saw. Notice how the TRIANGLE procedure was repeated three times to create the graphic.

## Research on Logo

Researchers and teachers are interested in using Logo as an aid to teaching mathematics, computer science, and problem solving. But because teaching computer languages in the schools is still a developing effort, there is little research information available on the interaction between computer language instruction and other areas of the curriculum. Reports about the use of Logo with students of all ages are consistently positive;

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Research on Logo

* There is little information on the interaction of a computer language and other areas of the curriculum.

* Most reports are positive, but not research-based.

* The Logo philosophy encourages exploratory learning, but there is little research to support this approach as one that works or is effective.

however, the majority of these reports are anecdotal rather than research-based.

Some Logo experts believe that Logo is better implemented when students are free from the constraints of a suggested sequence and direct teacher guidance. However, there is no research to substantiate this philosophy. In fact, without direct teacher intervention, students using Logo or any other programming language will not automatically transfer skills learned at the computer to non-computer tasks. Badger (1983) reported the results of a study conducted with groups of sixth graders who were given five weeks of training in Logo. At the end of that time, 69 percent of the students could instruct their Logo turtle to draw a 90-degree angle, but only 19 percent could draw the angle themselves using a pencil and paper.

## Vocabulary

| | |
|---|---|
| Application Programs: | Software programs designed to do special jobs such as word processing, saving information, helping calculate budgets, etc. |
| CAI: | Computer-Assisted Instruction. This is a very common acronym that denotes a broad class of instructional programs. Generally, they include drill and practice, tutorials, and simulations. These different types of CAI are defined at length in part III of the Guide. |
| Data Base: | In this context, it is an application program that stores a lot of information. You can store any kind of information (e.g., names and addresses of all students), and, with good programs, you can cross-reference information. For example, if you wanted to find out which students had study hall second period, you could enter "study hall" and "second period," and those names would appear on the screen. |
| Filer Program: | This is a specific kind of data base. It is popular because it can keep files of information, as you would keep them in folders in a filing cabinet. All of the material in the file is related to the main topic, and the information can be searched for in a manner described in the definition above. |
| Function Keys: | Extra keys on the computer keyboard, usually to the left and/or on the top. They permit the user to perform extra tasks. |
| Group CAI: | Students all work on the same CAI program at the same time. This is different from one student at a computer doing one program, another student at another computer working on another program, etc. It is related to the concept of networking. |
| Hardware: | The machine itself as well as any other devices, such as disk drives, monitors, printers, etc. |
| Hardware Compatibility: | The ability of different pieces of hardware to be connected to each other and operate correctly. For example, a Commodore 64 computer must have a Commodore 64 disk drive for it to receive information from the disk. However, it may be connected to many different brands of monitors. |
| Hard Disk: | A type of disk drive that often attaches to the computer. Unlike an ordinary disk drive, it stores much more information and, consequently, is much more expensive. |
| ICAI: | Intelligent Computer-Assisted Instruction. This kind |

of programming is far more complicated than typical forms of CAI. ICAI programs attempt to "diagnose" the learner's errors or response patterns and then act on these patterns. Different kinds of feedback are presented based on the diagnosis. Also, "socratic instruction" is a classic style of instruction with ICAI. Students are encouraged to induce answers based on selected information provided by the program.

Integrated Packages: Application programs that combine an electronic spreadsheet, a word processor, a data base manager etc., into one software. This means that all of these different programs can be used by the computer at one time. The advantage here is that you don't have to save information on one program, take it out, load the next one, and so on.

Interface: To connect, as in devices, so that each item runs properly.

Menus: These are very common on application programs. They are a list of choices or questions. The user simply selects a choice or answers a question, and the computer performs the operation. For example, in a word processor the menu may ask you to select the type of printer being used and the name of the document to be printed. With that information the computer will print your document.

Networking: Linking computers together so that they are connected to one main computer. Also, using devices such as keypads to send information to a main computer where it is processed.

Software: The programs that run on the machine. They are usually on floppy disks, sometimes on tapes.

Video Disk Instruction: Instruction is presented with a video disk player. A video disk player uses a disk about the size of a 33 1/3 rpm record and information is read with a needle or a laser. About 30 minutes of information can be stored on one side of the record using different forms of media: slides, videotape, computer graphics, etc.

48K or 64K: The K following the numbers denotes memory size. As an abbreviation for the metric term kilo, it indicates the amount of kilobytes of memory a computer has. Bytes are a unit of storage; one letter, for example, may be stored in one byte. 48K would mean about 48,000 kilobytes.

80 column format: A typewritten page usually allows a maximum of 80 letters on one line. On computers, each space that a letter would occupy is called a column.

## References


Aamandam, K. and Kelly, J.T. 1981/82. Evaluating the use of technology in education. Journal of Educational Technology Systems 10(1): 21-3.

Ahl, D.H. 1973. 101 BASIC computer games. Maynard, MA: Digital Equipment Corporation.

Anderson, B. 1982. Pascal beats out BASIC. Electronic Education 3: 21-29.

Becker, H. 1983. Microcomputers in the Classroom: Dreams and Realities. Eugene, OR: International Council for Computers in Education.

Block, J.H. 1971. Mastery Learning: Theory and Practice. New York: Holt, Rinehart, and Winston.

Bork, A. 1984. Technical horizons in education and computers: The situation today and some possible futures. T.H.E. Journal 12: 92-97.

Bunderson, C.V., B. Baillio, and J.B. Olsen. 1984. Instructional effectivness of an intelligent videodisc in biology. Machine-Mediated Learning 1(2): 175-215.

Dennis, J. 1982. Computer simulation and its instructional uses. The Illinois Series on Educational Applications of Computers 8E: 1-28.

Electronic Learning 3 (January, 1984): (features sheet).

Electronic Learning 3 (May/June 1984): (pie chart).

Electronic Learning 4 (September, 1984): (vendors price list).

Electronic Learning 4 (October, 1984): (disk chart).

Foreman, D. 1982. Search of the literature. The Computing Teacher 9(5): 37-49.

Garland, S.J. 1984. BASIC. Abacus 1: 39-49.

Greenblat, C. and Duke, R. 1981. Principles and practices of gaming-simulation. Beverly Hills, CA: Sage Publications.

Kearsley, G., B. Hunter, and R. Seidel. 1983. Two decades of computer based instruction projects: What have we learned? T.H.E. Journal 10(4): 88-96.

Kelman, P. et al. 1983. Computers in Teaching Mathematics. Reading, MA: Addisson-Wesley.

Lercarme, O. 1984. Pascal. Abacus 1: 58-66.

Morris, J.D. 1984. The Florida study: Improving achievement through the use of more dynamics in TV production. T.H.E. Journal (12): 104-107.

Neill, S.B. 1984. High tech for schools: Problems and solutions.

Arlington, Va.: American Association of School Administrators.

O'Loughlin, M. and White, M. 1982. Improving teaching on television: The utility of direct instruction programs. Paper presented at Annual Convention of the APA, Washington, D.C.

Rogers, J. 1984. Computer use in precollege education. Computer 17: 46-56.

Spain, T. 1984. Networking: Pie in the sky or icing on the cake? Electronic Learning 4: 48-51.

Splittgerber, F.L. 1979. Computer-based instruction: A revolution in the making? Educational Technology 19(1): 20-26.

Torrance, E.P. 1980. Implications of whole-brained theories of learning and thinking for computer-based instruction. Journal of Computer-Based Instruction 7(4): 99-105.

# APPENDIX

I. TRANSPARENCIES

II. ACTIVITIES

III. HANDOUTS

# I. MASTERS FOR TRANSPARENCIES

TRANSPARENCY #1

## WHAT DO TEACHERS THINK OF MICROCOMPUTER USE?

PERCENTAGE OF TEACHERS REPORTING REGULAR OR EXTENSIVE USE OF MICROCOMPUTERS AT THEIR SCHOOL.

| PURPOSE | ELEMENTARY | SECONDARY |
|---|---|---|
| INTRODUCING COMPUTERS | 64% | 85% |
| PROGRAMMING INSTRUCTION | 47% | 76% |
| PROGRAMMING TO SOLVE PROBLEMS | 27% | 29% |
| BUSINESS EDUCATION, VOCATIONAL | -- | 29% |
| DRILL AND PRACTICE | 59% | 31% |
| TUTORING FOR SPECIAL STUDENTS | 49% | 20% |
| DEMONSTRATIONS, LABS, SIMULATIONS | 20% | 22% |
| RECREATIONAL GAMES | 24% | 19% |
| ADMINISTRATIVE USE | 10% | 14% |
| TEACHER RECORD KEEPING | 7% | 15% |
| TEACHER TESTS, WORKSHEETS | 5% | 10% |
| STUDENT PAPERS, WORD PROCESSING | 3% | 7% |

## THE MICROCOMPUTER'S IMPACT AS VIEWED BY TEACHERS.

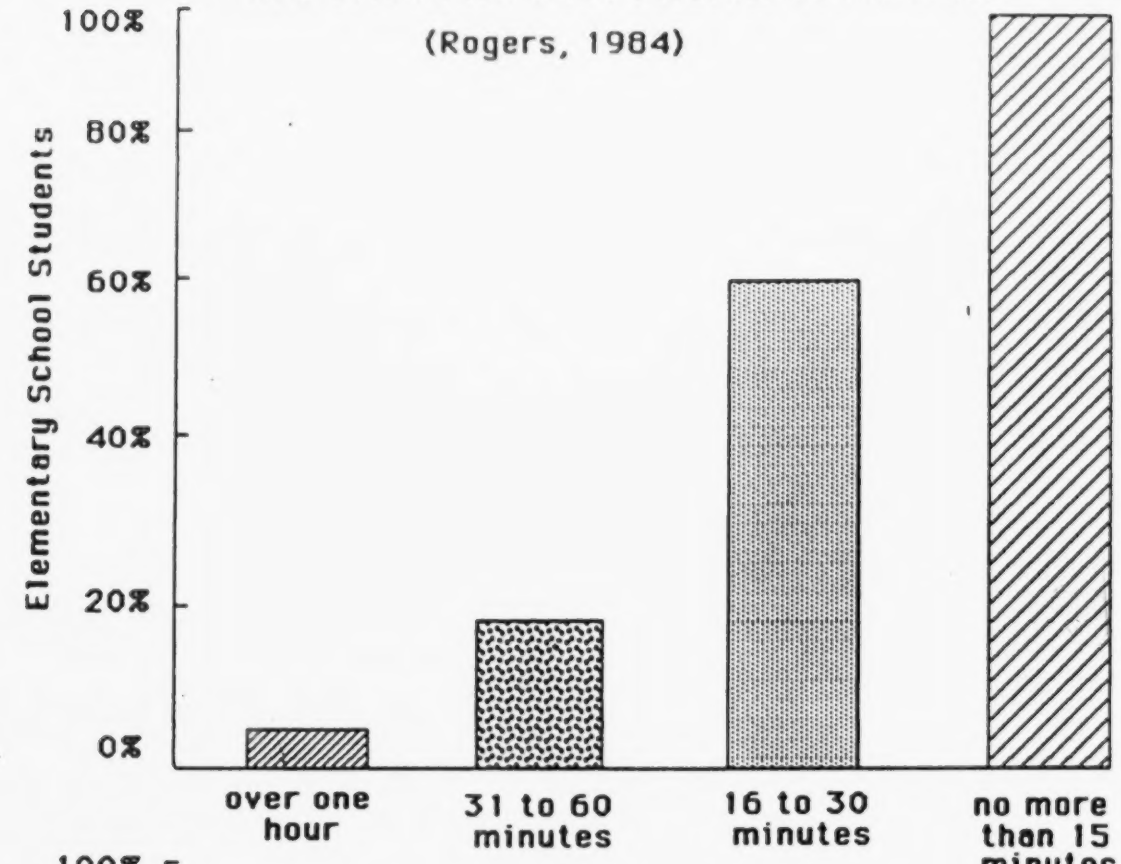
| PERCEIVED BENEFITS DUE TO MICROCOMPUTERS | PERCENTAGE RESPONDING 'YES' |
|---|---|
| STUDENTS USING COMPUTERS HAVE MUCH MORE GENERAL ENTHUSIASM FOR SCHOOL. | 30% |
| PERFORMANCES OF "ABOVE AVERAGE" STUDENTS HAVE GREATLY IMPROVED. | 24% |
| MANY MORE STUDENTS ARE WORKING INDEPENDENTLY. | 18% |
| MANY MORE STUDENTS HELP OTHER STUDENTS WITH THEIR QUESTIONS. | 15% |
| MANY MORE STUDENTS DO WORK MORE APPROPRIATE TO THEIR OWN ABILITY LEVEL. | 12% |
| PERFORMANCES OF "BELOW AVERAGE" STUDENTS HAVE GREATLY IMPROVED. | 7% |
| PERFORMANCES OF "AVERAGE" STUDENTS HAVE GREATLY IMPROVED. | 5% |

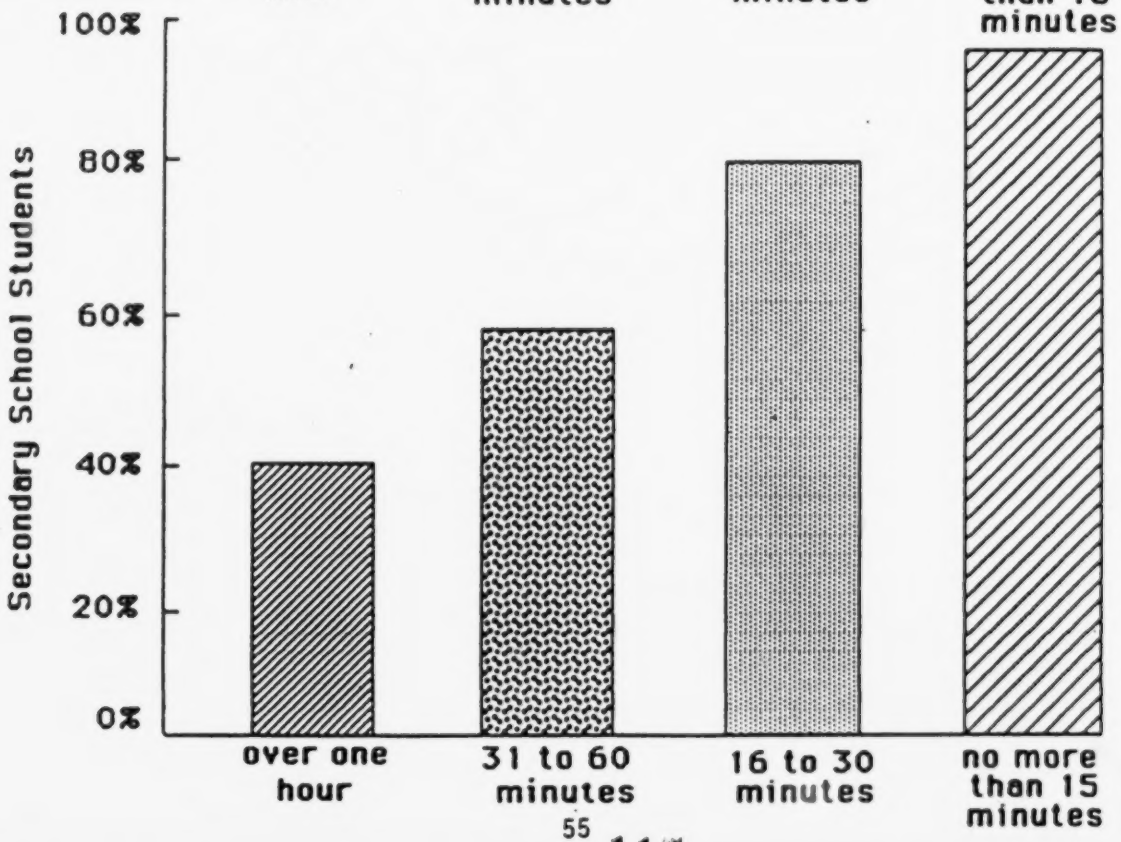
(ROGERS, 1984)

TRANSPARENCY #2

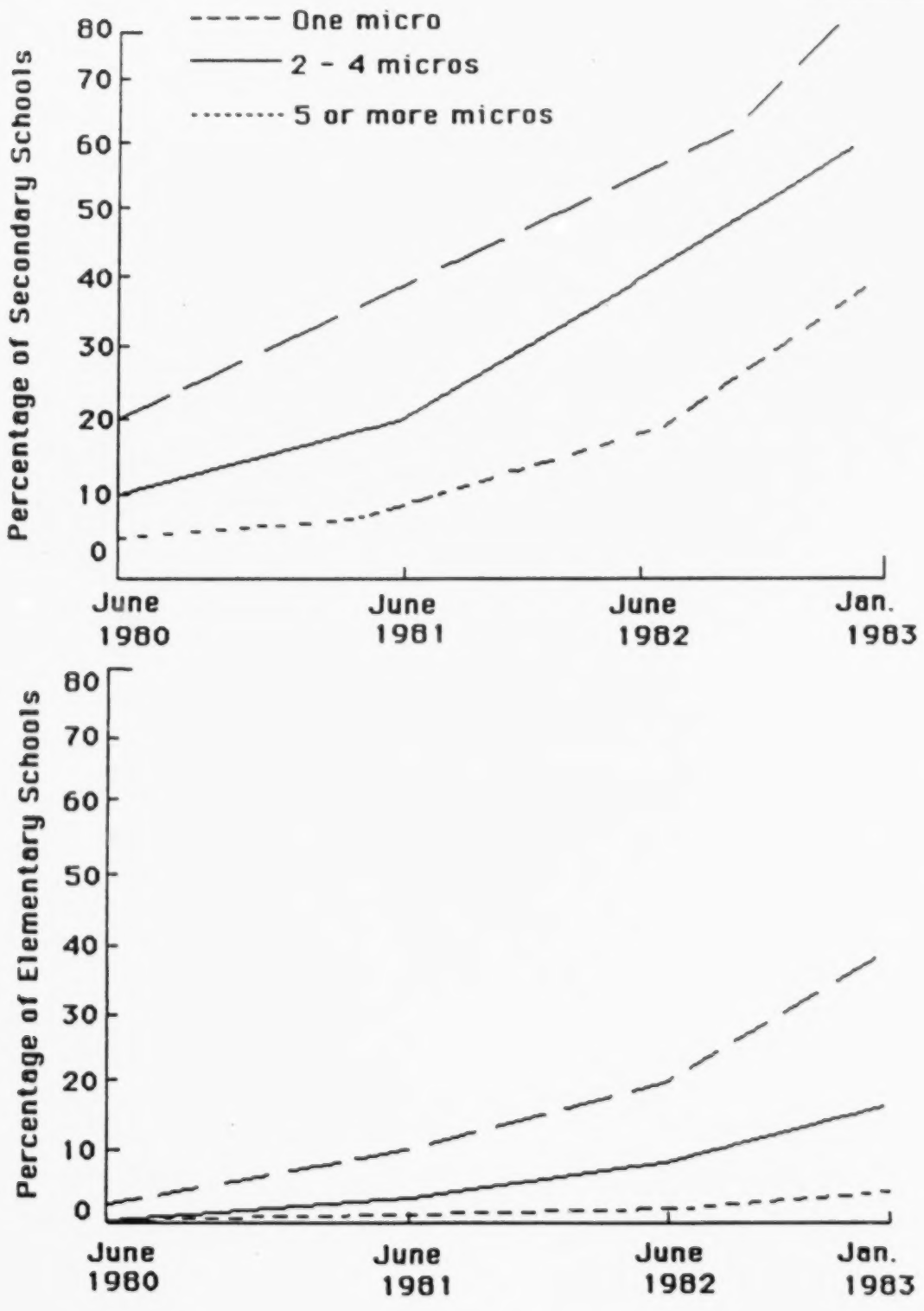
How often each week students use micros.

(Rogers, 1984)



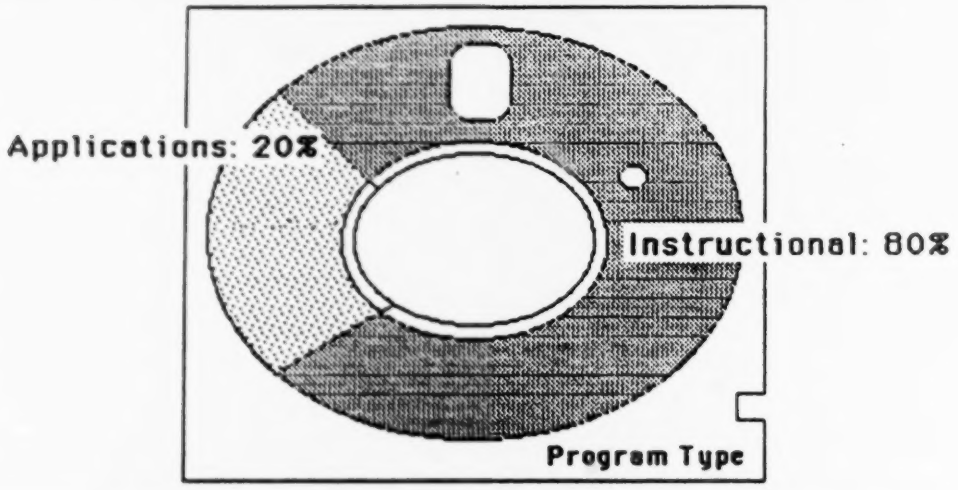
TRANSPARENCY #3




Microcomputers in the schools: 1980 - 1983 (Rogers, 1984)

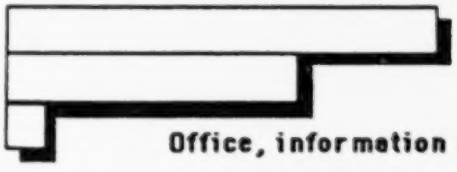
Information on 81 new software titles released to Electronic Learning Magazine between July 1 and September 1, 1984.

TRANSPARENCY #4




| Machine Compatability: Apple | Atari | Commodore | IBM PC | Radio Shack |
|---|---|---|---|---|
| Application Programs 31% | 0% | 12% | 69% | 6% |
| Instructional programs 69% | 15% | 26% | 21% | 9% |

Application Programs: 16 Titles

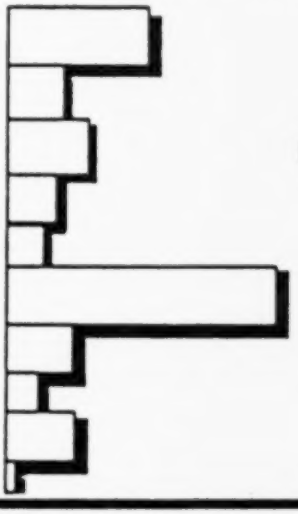


Word Processing: 56%

Classroom Management: 38%

Office, information and financial management: 6%

Instructional Programs: 65 Titles



Math: 18%

Language Arts: 8%

Programming (languages and tools): 11%

Art/ Graphics: 6%

Social Studies: 5%

Science: 29%

Music: 9%

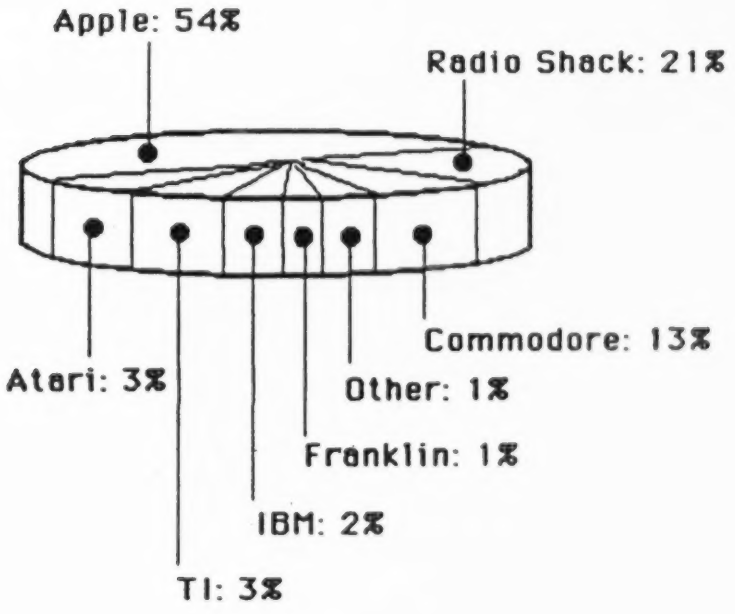
Computer Literacy: 3%

Logic: 9%

SAT Preparation: 1%

# The School Microcomputer Market, Fall 1983

(percentage of schools with at least one unit)




Taken from Electronic Learning Magazine Nov/Dec. 1984

TRANSPARENCY #6A

## COMPUTER PRICES SUMMER 1984*

| | LIST PRICE | DISCOUNT STORE | EDUCATOR'S PRICE AUTHORIZED DEALER |
|---|---|---|---|
| ATARI 800XL | | | |
| 64K RAM, 1 DISK DRIVE | $680 | $537 | $565 |
| 64K RAM, 2 DISK DRIVE | $1130 | $846 | $890 |
| APPLE IIe | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $1550 | $1000 | $850 |
| 64K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | $1879 | $1350 | $1080 |
| 128K RAM, MONOCHROME MONITOR 1 DISK DRIVE | $1845 | $1129 | $1056 |
| COMMODORE 64 | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DIVE | — | $540 | $540 |
| 64K RAM, COLOR MONITOR, 1 DISK DRIVE | — | $640 | $680 |
| 64K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | — | $780 | $780 |
| FRANKLIN ACE | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | — | $895 | $640 |
| 64K RAM, COLOR MONITOR, 1 DISK DRIVE | — | $1055 | $790 |
| 64K RAM MONOCHROME MONITOR, 2 DISK DRIVES | — | $1095 | $825 |
| 128K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | — | $1054 | $825 |

TRANSPARENCY #6B

| | LIST PRICE | DISCOUNT STORE | EDUCATOR'S PRICE AUTHORIZED DEALER |
|---|---|---|---|
| IBM PC | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $2090 | $1800 | $1672 |
| 64K RAM, RGB MONITOR, 1 DISK DRIVE | $2770 | $2344 | $2216 |
| 64K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | $2515 | $2140 | $2012 |
| 128K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $2190 | $1860 | $1752 |
| IBM PCJR | | | |
| 128K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $1275 | $1000 | $1020 |
| 128K RAM, RGB MONITOR, 1 DISK DRIVE | $1680 | $1320 | $1324 |
| 128K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | $1700 | $1239 | $1360 |
| RADIO SHACK COLOR COMPUTER 2 | | | |
| 64K RAM, 1 DISK DRIVE | $660 | --- | $515 |
| 64K RAM, 2 DISK DRIVES | $940 | --- | $734 |
| TRS-80 MODEL 4 | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $1600 | --- | $1247 |
| 64K RAM, COLOR MONITOR, 2 DISK DRIVES | $1920 | -- | $1506 |
| 128K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $1680 | --- | $1309 |

*NOTE: PRICES VARY GREATLY DEPENDING ON TIME AND REGION. THESE WERE EFFECTIVE IN THE NEW YORK AREA IN SUMMER 1984.

(FROM ELECTRONIC LEARNING MAGAZINE SEPT. 1984)

TRANSPARENCY #7

## HARDWARE, SOFTWARE, AND HOW THEY'RE USED IN SCHOOLS

* WHAT KIND OF COMPUTERS SHOULD A DISTRICT PURCHASE?

* SHOULD THE DISTRICT BUY THE SAME BRAND OF COMPUTERS AS OTHER DISTRICTS ARE BUYING?

* CAN THE NEW COMPUTERS BE INTEGRATED WITH COMPUTERS ALREADY OWNED BY THE DISTRICT?

TRANSPARENCY #8

## IEP MANAGER CRITERIA

1. GENERAL HARDWARE AND SOFTWARE CONCERNS

   * WHICH TYPE OF MICROCOMPUTER IS IT DESIGNED FOR? DOES THE DISTRICT HAVE THAT KIND? IF NOT, WHAT DOES IT COST?
   * IS A HARD DISK REQUIRED? IF SO, WHAT IS ITS COST?
   * CAN THE PROGRAM BE UPLOADED/DOWNLOADED INTO OTHER COMPUTERS?
   * ARE THERE ADDITIONAL COSTS TO THE SOFTWARE? UPDATES? MODIFICATIONS? CONSULTANT FEES?
   * IS THE PROGRAM WELL DOCUMENTED, INCLUDING A CLEARLY WRITTEN MANUAL?
   * CAN IT BE LINKED TO OTHER SOFTWARE (E.G. WISC-R SCORING LINKED TO COMPUTERIZED NORM REFERENCE TEST SCORING)?

2. SPECIFIC IEP MANAGER COMPONENTS: WHAT EXISTS AND WHAT CAN BE MODIFIED?

   * DOES IT INCLUDE THE STANDARD IEP REQUIREMENTS (E.G. GOALS AND OBJECTIVES, PARENT NOTIFICATION, ANNUAL REVIEW AND THREE YEAR EVALUATION FORMS)?
   * IS THERE A CAPACITY FOR ADMINISTRATIVE REPORTS AT THE DISTRICT AND STATE LEVEL?
   * ARE THERE ADDITIONAL STUDENT INFORMATION FUNCTIONS INCLUDED (E.G. REPORT CARDS, CLASS SCHEDULES, STATISTICAL INFORMATION ON STUDENT PROGRESS)?
   * HOW EASY IS IT TO CHANGE STUDENT DATA? DOES ALL OF THE DATA HAVE TO BE RE-ENTERED?
   * DOES THE PROGRAM PROVIDE A CLEAN, NICELY FORMATTED HARD COPY OF THE IEP?
   * MOST OF ALL, HOW EASY IS THE SYSTEM TO USE? CAN A NOVICE LEARN THE ENTIRE SYSTEM OR AT LEAST ITS IMPORTANT PARTS?

TRANSPARENCY #9

## GRADE BOOK PROGRAMS

A GOOD GRADE BOOK PROGRAM SHOULD:

1. ALPHABETIZE THE STUDENTS IN THE CLASS.

2. AVERAGE A STUDENT'S SCORE FOR A TERM.

3. ASSIGN A GRADE.

4. PRINT CLASS RANKINGS.

5. CALCULATE OTHER SIMPLE DISTRIBUTIONS.

TRANSPARENCY #10

## DRILL AND PRACTICE RESPONSE FORMATS

### A TWO-WAY CHOICE ALTERNATIVE.

THE GREAT WALL IS LOCATED IN CHINA.

TYPE Y OR N.

### MULTIPLE-CHOICE ITEMS.

ONE GALLON IS EQUAL TO _____.

A. 4 PINTS.
B. 4 LITERS.
C. 4 QUARTS.
D. 4 OUNCES.

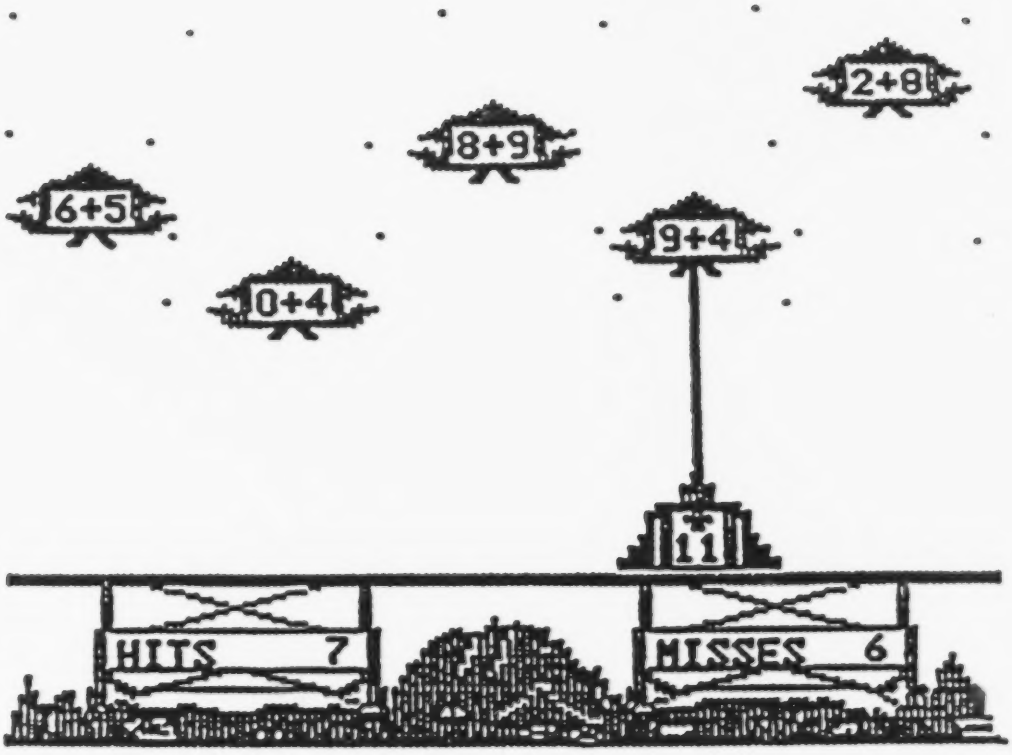
TYPE THE LETTER OF THE CORRECT ANSWER.

### FILL-IN-THE-BLANK ITEMS.

6 X 5 = _____

TYPE THE CORRECT ANSWER.

TRANSPARENCY #11



TRANSPARENCY #12

## CRITICISMS OF DRILL AND PRACTICE

1. MICROCOMPUTERS ARE TOO EXPENSIVE AND TOO LIMITED TO BE USED AS AUTOMATIC FLASH CARD MACHINES.

2. POORLY CONCEIVED DRILL AND PRACTICE PROGRAMS HAVE BEEN CHARACTERIZED AS MONOTONOUS AND BORING.

3. DRILL AND PRACTICE PROGRAMS HAVE SOMETIMES BEEN CRITICIZED FOR REINFORCING INCORRECT LEARNING.

4. DRILL AND PRACTICE PROGRAMS MAY NEGATIVELY INFLUENCE INSTRUCTION BY REDUCING LEARNING TO A TRIVIA GAME, IMPLYING ALL QUESTIONS HAVE ONE CORRECT ANSWER.

TRANSPARENCY #13

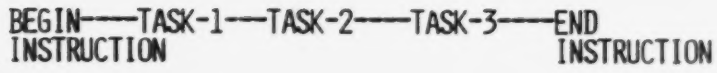
## THE POTENTIAL VALUE OF DRILL AND PRACTICE

1. MOST EDUCATORS AGREE THAT EVERY CONTENT AREA HAS IMPORTANT FACTS THAT STUDENTS MUST LEARN - DRILL AND PRACTICE PROGRAMS CAN HELP HERE.

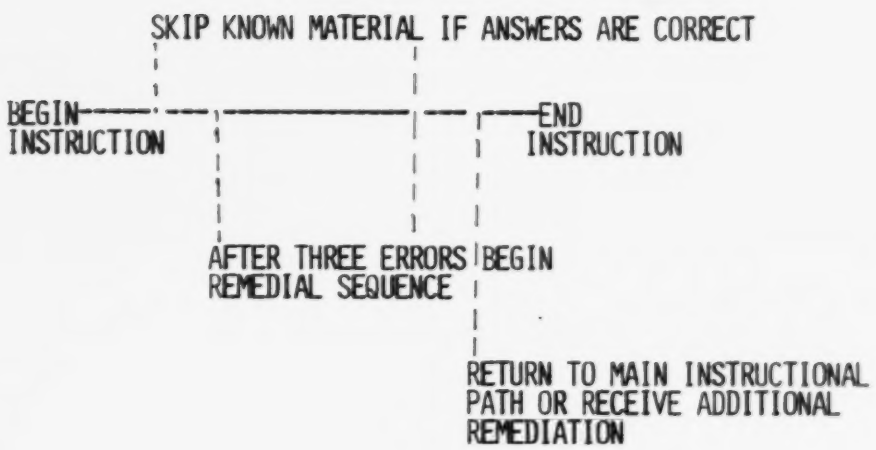
2. CURRENT STUDIES OF CONVENTIONAL INSTRUCTION REPORT THAT THE FREQUENCY OF FACTUAL SINGLE ANSWER QUESTIONS IS POSITIVELY RELATED TO GAIN IN STUDENT ACHIEVEMENT.

3. DRILL AND PRACTICE PROGRAMS CAN RELIEVE THE POTENTIAL DRUDGERY OF REPETITIOUS TASKS FOR BOTH THE TEACHER AND THE LEARNER.

## LINEAR INSTRUCTIONAL DESIGN




## BRANCHING INSTRUCTIONAL DESIGN


SKIP KNOWN MATERIAL IF ANSWERS ARE CORRECT
BEGIN INSTRUCTION
END INSTRUCTION
AFTER THREE ERRORS REMEDIAL SEQUENCE
BEGIN
RETURN TO MAIN INSTRUCTIONAL PATH OR RECEIVE ADDITIONAL REMEDIATION

## SAMPLE DIALOGUE FROM AN INTELLIGENT COMPUTER-ASSISTED INSTRUCTION PROGRAM

C: HELLO.
WHAT'S YOUR NAME?

S: MIKE.

C: HELLO, MIKE.
I'M GOING TO TEACH YOU A RULE ABOUT TEMPERATURE.
THE CLOSER A COUNTRY IS TO THE EQUATOR THE WARMER ITS CLIMATE.
LOOK AT THE MAP IN YOUR TEXTBOOK, MIKE.
IS BRAZIL CLOSER TO THE EQUATOR THAN FINLAND?

S: YES.

C: THAT'S CORRECT, MIKE.
SO WHICH COUNTRY HAS THE WARMER CLIMATE?
BRAZIL OR FINLAND?

S: BRAZIL.

C: YOU'RE CORRECT AGAIN MIKE.
TELL ME WHY IT'S WARMER.

S: BECAUSE IT'S CLOSER TO THE EQUATOR.

C: RIGHT.
LOOK AT YOUR MAP AGAIN.
TELL ME THE NAME OF ANOTHER COUNTRY THAT'S WARMER THAN FINLAND.

S: CINCINNATI.

C: THAT'S NOT A COUNTRY, MIKE.
PLEASE TRY AGAIN.
TELL ME THE NAME OF A COUNTRY THAT'S WARMER THAN FINLAND.

IF YOU WRITE:

Jane's voice was clear and firm, yet her trembling hands clenching her report showed she was uneasy.

This is the third person point of view. The writer reports the event without calling attention to being an observer.

Press SPACE BAR to continue

## STUDENT RESPONSE CATEGORIES FOR TUTORIAL PROGRAMS

### CORRECT OR SYNONYMOUS ANSWER

C: NAME THE THIRD PLANET IN THE SOLAR SYSTEM.
S: EARTH.
C: THAT'S CORRECT. YOUR ANSWER MATCHES WITH MY ANSWER.

THE STUDENT'S ANSWER IS A PERFECT MATCH WITH THE ANSWER ANTICIPATED IN THE PROGRAM.

### LITERALLY INCORRECT BUT CONCEPTUALLY CORRECT ANSWER

C: NAME THE THIRD PLANET IN THE SOLAR SYSTEM.
S: ERTH.
C: THAT'S INCORRECT. YOUR ANSWER DOES NOT MATCH WITH MY ANSWER.

THE STUDENT'S ANSWER IS CONCEPTUALLY CORRECT BUT IS REGARDED AS AN ERROR BECAUSE IT IS MISSPELLED. THE PROGRAM'S DESIGN DOES NOT ENABLE IT TO ACCEPT APPROXIMATIONS OF THE CORRECT SPELLING OF A WORD.

### UNANTICIPATED BUT NOT NECESSARILY INCORRECT ANSWER

C: NAME THE THIRD PLANET IN THE SOLAR SYSTEM.
S: PLANET EARTH.
C: PLANET EARTH IS NOT THE NAME OF A PLANET IN THE SOLAR SYSTEM.

THE STUDENT'S ANSWER IS CORRECT; HOWEVER, THE PROGRAM'S DESIGN DOES NOT ENABLE IT TO IGNORE THE WORD "PLANET" AND SIMPLY SEARCH FOR "EARTH."

### ANTICIPATED ERROR THAT REFLECTS MISLEARNING

C: NAME THE THIRD PLANET IN THE SOLAR SYSTEM.
S: VENUS.
C: THAT'S INCORRECT. VENUS IS THE SECOND PLANET IN THE SOLAR SYSTEM.

THE STUDENT'S ANSWER INDICATES THAT (A) THE STUDENT MAY NOT HAVE BEEN TAUGHT THAT THE SUN IS NOT A PLANET, THUS AFFECTING THE STUDENT'S ORDERING OF THE PLANETS OR (B) THE STUDENT SIMPLY DOES NOT RECALL THE CORRECT ANSWER.

**WELCOME TO WHITETAIL HOLLOW**

You live in a suburban community of 2500 residents (about 600 houses) near a large city. At the village council meeting last night, many of your neighbors said they have had problems with deer coming into their yards.

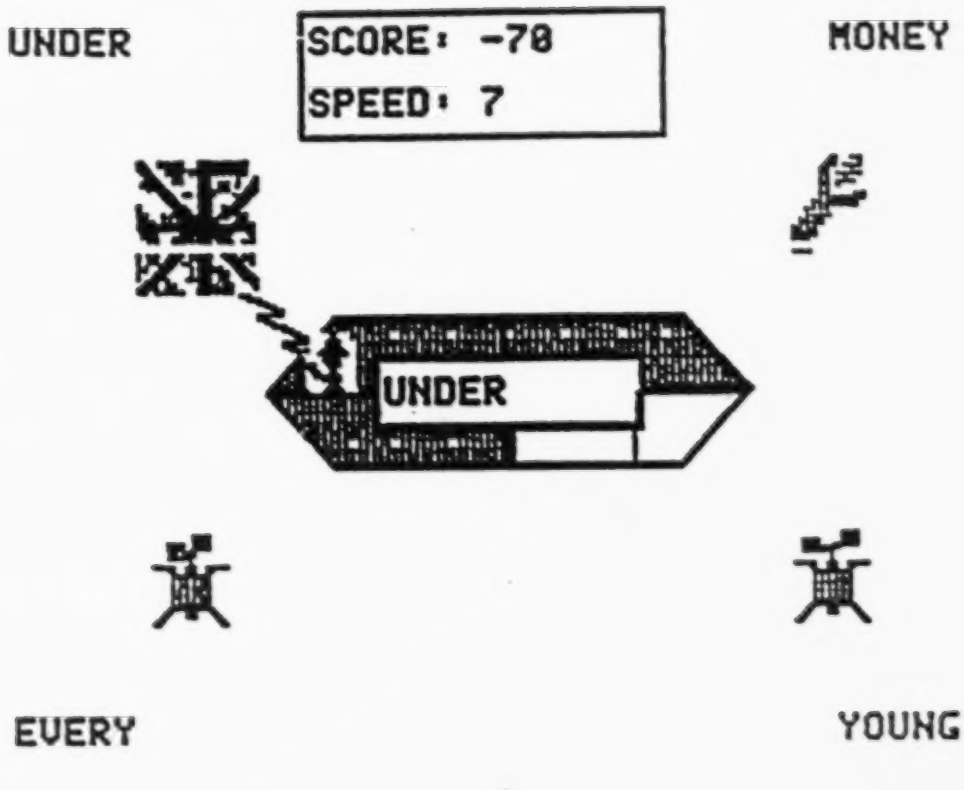
Deer have been grazing on lawns, nibbling trees and shrubs -- even harvesting produce from gardens!

Press SPACE BAR to continue

TRANSPARENCY #19

## DIFFERENT TYPES OF GAME DESIGNS

1. GUESSING GAMES
2. PILES OF OBJECTS
3. MATRIX
4. HISTORY/GOVERNMENT
5. SPORTS
6. LOGIC/STRATEGY
7. GAMBLING
8. CARD AND BOARD
9. WAR
10. SPACE
11. WORD
12. DATA GAMES


UNDER
SCORE: -70
SPEED: 7
MONEY
UNDER
EVERY
YOUNG

TRANSPARENCY #21

## THE POTENTIAL VALUE OF INSTRUCTIONAL GAMES

1. THEY ARE WELL SUITED TO THE ATTAINMENT OF INSTRUCTIONAL OBJECTIVES THAT INVOLVE RECOGNITION, DISCRIMINATION, OR REPETITIVE DRILL.

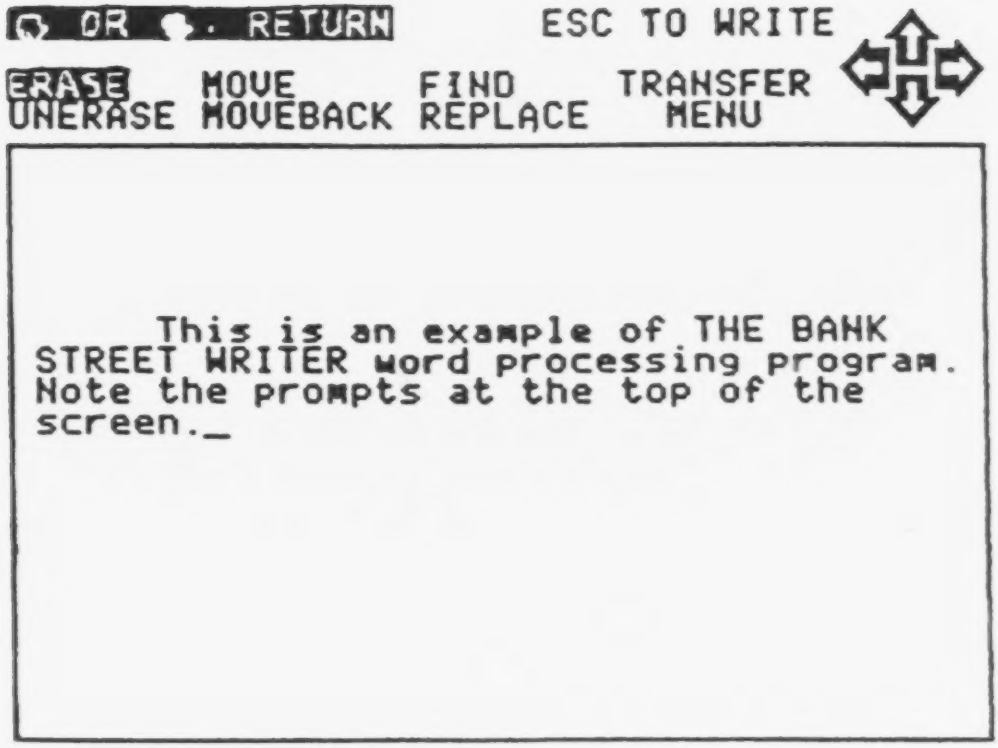
2. THEY HAVE THE POTENTIAL TO MOTIVATE STUDENTS ON REPETITIOUS TASKS.

3. THEY TEACH SPATIAL AND EYE-HAND COORDINATION.

4. THEY ENABLE THE STUDENT TO HAVE SUCCESS WHILE MASTERING NEW INFORMATION.

5. THEY HELP ILLUSTRATE IMPORTANT COMPUTER PROCESSES.

TRANSPARENCY #22



TRANSPARENCY #23

## COMMON OPINIONS ABOUT WRITING WITH A COMPUTER

1. THE USE OF COMPUTERS IN COMPOSITION INSTRUCTION SHOULD NOT FOCUS ON DRILLS AND EXERCISES ABOUT SPELLING, GRAMMAR, ETC. (PAPERT, 1980; SCHWARTZ, 1983).

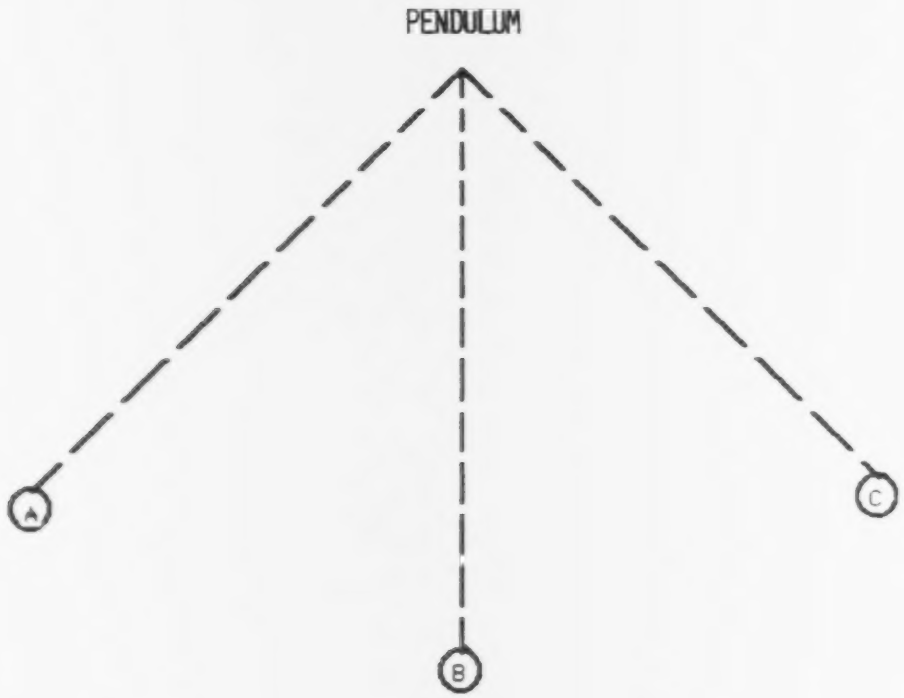
2. TO FACILITATE THE USE OF A WORD PROCESSOR STUDENTS SHOULD RECEIVE FORMAL INSTRUCTION IN KEYBOARDING (TYPING) SKILLS (KISNER, 1984).

3. THE PROCESS APPROACH TO WRITING SHOULD BE FOLLOWED WHEN USING A WORD PROCESSOR FOR COMPOSITION INSTRUCTION (GREEN, 1984; RUBIN, 1983; SCHWARTZ, 1982).

4. SOFTWARE DEVELOPERS SHOULD EMPHASIZE THE DEVELOPMENT OF PROGRAMS THAT LEAD STUDENTS THROUGH IMPORTANT STEPS IN THE WRITING PROCESS (RUBIN, 1983).

5. A WORD PROCESSING PROGRAM FOR USE WITH STUDENTS SHOULD HAVE A LIMITED NUMBER OF COMMANDS (BRADLEY, 1982).

AN EXAMPLE OF ECONOMY OF EXPLANATION (SIMPLICITY IN REPRESENTATION OF KNOWLEDGE): HARMONIC MOTION




CONSERVATION OF ENERGY: POTENTIAL ENERGY + KINETIC ENERGY = A CONSTANT. WHEN THE POTENTIAL ENERGY IS MAXIMUM (POSITION A), THE KINETIC ENERGY IS ZERO.

WHEN KINETIC ENERGY IS MAXIMUM (POSITION B), THE POTENTIAL ENERGY IS ZERO.

## AN EXAMPLE OF POWER IN AN EXPLANATION

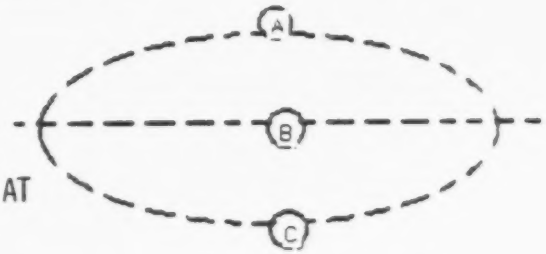
CONSERVATION OF ENERGY: POTENTIAL ENERGY + KINETIC ENERGY = A CONSTANT. WHEN THE POTENTIAL ENERGY IS MAXIMUM (POSITION A), THE KINETIC ENERGY IS ZERO.

WHEN KINETIC ENERGY IS MAXIMUM (POSITION B), THE POTENTIAL ENERGY IS ZERO.

### GRAVITY WAVES IN FLUIDS

GENERATING FORCE: WIND
RESTORING FORCE: BUOYANCY

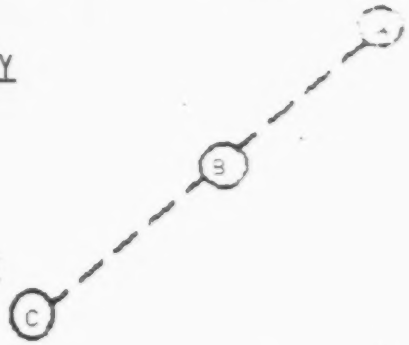
WIND MOVING ACROSS THE WATER CAUSES WAVES BEGINNING AT POSITION B AND THE WATER MOVES TO POSITION A. THE WATER AT POSITION A BECOMES LESS BUOYANT AND DROPS BACK, OVERSHOOTING B TO C.




### ELECTRICITY

GENERATING FORCE: PARTICLE COLLISION
RESTORING FORCE: ELECTRIC FIELD

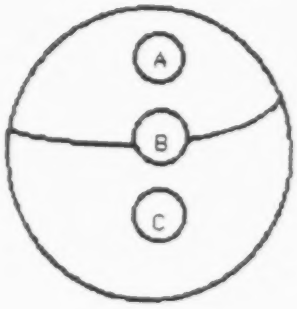
PARTICLES COLLIDE AT POSITION B AND A PARTICLE MOVES TO POSITION A. THE FORCE OF THE ELECTRICAL FIELD PULLS IT BACK OVERSHOOTING B TO C.




### CLOUD MOVEMENT

GENERATING FORCE: WIND, HEAT
RESTORING FORCE: ANGULAR MOMENTUM

WIND AND HEAT PUSH THE CLOUDS FROM B TOWARD A. ANGULAR MOMENTUM (CIRCULAR MOTION) PULLS THE CLOUDS BACK OVERSHOOTING B TO C.



TRANSPARENCY #26

## FOUR STAGES FOR CORE CONCEPTS CHECKPOINTS

1. AFTER EACH NEW INSTRUCTIONAL SEGMENT FROM A LESSON. THESE PRACTICE PROBLEMS SERVE AS AN IMMEDIATE CHECK.

2. BEFORE THE BEGINNING OF THE NEXT LESSON. THIS BRIEF QUIZ IS A ONE-DAY DELAY CHECK.

3. AFTER EVERY FOURTH LESSON. THIS MASTERY TEST IS A ONE-WEEK DELAY CHECK.

4. AT THE END OF EACH GRADING PERIOD. THIS EXAM IS A MULTI-WEEK DELAY CHECK.

TRANSPARENCY #27

## WHICH PROGRAMMING LANGUAGE: BASIC OR PASCAL?

THE CRITERIA FOR A LANGUAGE:

1. EXPLICITNESS
2. COHERENCE
3. MODULARITY
4. VERSATILITY
5. READABILITY

(ANDERSON, 1983)

### BASIC

PROS

1. IT IS EASY TO LEARN
2. IT IS STANDARD ON MOST MICROCOMPUTERS
3. STRUCTURED BASIC TEACHES GOOD PROGRAMMING HABITS
4. IT IS TAUGHT IN MOST HIGH SCHOOL COMPUTING CLASSES

CONS

1. IT TENDS TO BE UNREADABLE
2. IT ALLOWS TOO MANY SHORTCUTS AND TEACHES BAD PROGRAMMING HABITS
3. STRUCTURED BASIC IS NOT COMMONLY AVAILABLE ON MICROCOMPUTERS
4. IT DOESN'T TEACH CENTRAL PROGRAMMING CONCEPTS AS WELL AS OTHER LANGUAGES

### PASCAL

PROS

1. IT SATISFIES THE CRITERIA ABOVE AND MORE
2. IT IS POPULAR IN INDUSTRY AND AT THE UNIVERSITY LEVEL
3. IT HAS BEEN RECOMMENDED BY AN ACM EDUCATION COMMITTEE
4. IT IS THE LANGUAGE OF THE ADVANCED PLACEMENT TEST
5. IT TEACHES GOOD PROGRAMMING HABITS AND CONCEPTS

CONS

1. IT IS NOT STANDARD ON POPULAR MICROCOMPUTERS
2. IT IS NOT THAT EASY TO LEARN
3. IT CAN BE AN EXPENSIVE PIECE OF SOFTWARE

## "PLAYING POKER" WITH TWO LANGUAGES - PARTIAL PROGRAMS

### BASIC

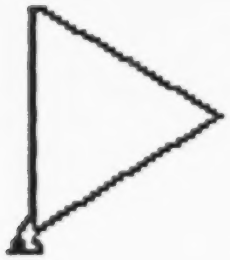
```
1 PRINT--:POKE53280,6:POKE53281,6:PRINT--;CHR$(15)
2 PRINT--SPC(15)-BLACKJACK':FORI=1TO1000:NEXT
5 DIM C%(51)
6 W1$=--:W2$=--:W3$=--:W4$=--:W7$=W2$+--
7 B$=--:FORZ1=1TO30:B$+- -:NEXT
8 W8$=-        -:W9$=-&&&&&&&-:YY$=-YOU HAVE-:FF=1
22 PRINT--:YZ$=-ASXZA234567891JQK-:GOSUB30:GOTO235
30 W$=-S H U F F L I N G-:GOSUB50110:GOSUB51540
35 FORI=0TO51:C%(I)=I:NEXT
40 FORI=0TO51
41 R=51*RND(1)+1
42 TE=C%(I):C%(I)=C%()=TE:NEXT:R=0:E=1
45 RETURN
100 PRINT -A-Y%- -Y%-A-;:RETURN
101 PRINT-2-Y$--Y$--Y$---Y$--Y$-2-;:RETURN
102 PRINT-3-Y$--Y$--Y$--Y$--Y$--Y$-3-;:RETURN
103 GOSUB116:GOTO119
104 GOSUB113:GOTO121
105 GOSUB117:GOTO119
106 GOSUB105:PRINT--Y$;:RETURN
107 GOSUB118:GOTO119
108 GOSUB107:GOTO121
109 GOSUB118:PRINT--W1$W3$-10-Y$--Y$-10-;:RETURN
110 PRINT - _)-W3-G* %W3$-G  H-;
```

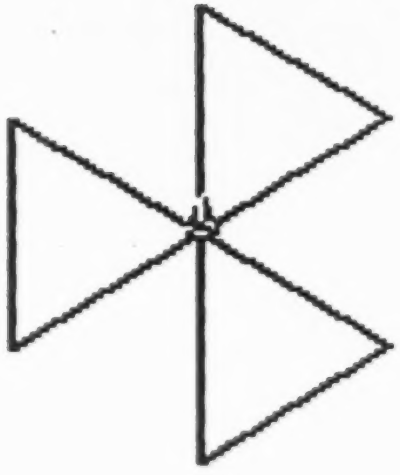
### PASCAL

```
PROGRAM POKERGAME; (*THIS IS A POKER PLAYING PROGRAM*)

    USES APPLESTUFF;
    CONST CARDNUMBER = 52;
          LINE ='  !----------!';
    TYPE RANK = (TWO,THREE,FOUR,FIVE,SIX,SEVEN,EIGHT,NINE,TEN,JACK,
                 QUEEN,KING,ACE);
         SUITE = (SPADES,DIAMONDS,HEARTS,CLUBS);
         POKERCARD = RECORD
                       OWNRANK:RANK;
                       OWNSUIT:SUIT;
                     END;
         POKERDECK = ARRAY [1..52] OF POKERCARD;
         POKERBOARD = ARRAY [1..6,1..5] OF POKERCARD;

     VAR DECK: POKERDECK;
         BOARD: POKERBOARD;
         OUTFILE: TEXT;
         FLAG,SENT,CHECK:BOOLEAN;

PROCEDURE SETCARD (VAR DECK:POKERDECK); (*CREATES A DECK OF CARDS*)

     VAR INDEX: INTEGER;
         SUITORDER:SUIT;
```

## SAMPLE LOGO PROCEDURE FOR DRAWING A TRIANGLE

```
TO TRIANGLE
FORWARD    60
RIGHT      120
FORWARD    60
RIGHT      120
FORWARD    60

  END
```





```
?CS
?REPEAT 3[TRIANGLE]
?
```

# II. MASTERS FOR ACTIVITIES

## General Notes on Activities

Activity #1 is a warm-up for your presentation. Give the group about 10 minutes to match the terms and their definitions, then go back and discuss the correct answers. You may want to distribute copies of the answer key at the end of the discussion.

Activity #2 gives the group a chance to test out its knowledge of costs of computer systems. Use this activity after covering Section II, Administrators and Computers. The instructions are included in the activity, as is information on prices and available systems.

Activity #3 is a chance for participants to react to some commonly held beliefs about using computers in the schools. Use this activity after covering Section III, Computer-Assisted Instruction. The directions are included.

(You may wish to add activities of your invention too.)

## Activity #1 - Matching Vocabulary

TIME: 10 MINUTES

Instructions: How much of today's computer jargon do you know? Take a moment and complete the matching exercise on the next three pages. Write a letter next to the definition in the space of the appropriate word.

(Note to the presenter: At the end of ten minutes, go over the answers using the answer key provided. Encourage the participants to use this exercise as a reference throughout the presentation.)

## How Many of These Words Do You Know?

| | |
|---|---|
| ____APPLICATION PROGRAMS: | A. It denotes a memory size. As an abbreviation for the metric term kilo, it indicates the amount of kilobytes of memory a computer has. (Bytes are a unit of storage.) |
| ____CAI: | B. To connect, as in devices, so that each item runs properly. |
| ____DATA BASE: | C. Instruction is presented with a special machine. Disks about the size of a 33-1/3 record are used, and information is read from them by a needle or a laser. About 30 minutes of information can be stored on one side of the disk using different forms of media (e.g. slides, videotape, computer graphics, etc.) |
| ____FILER PROGRAM: | D. A common name for the device that you insert into the disk drive. It stores programs, data, and other kinds of information. |
| ____FLOPPY DISK: | E. The maximum number of letters that can be typed on one line. |
| ____FUNCTION KEYS: | F. The ability of different pieces of hardware to be connected to each other and operate correctly. |
| ____GROUP CAI: | G. Linking computers together so that they are connected to one main computer. Also, using devices such as keypads to send information to a main computer where it is processed. |
| ____HARDWARE: | H. These are very common on application programs. They are a list of choices or questions. The user simply selects the choice or answers the question, and the computer performs the selected operation. |
| ____HARDWARE COMPATIBILITY: | I. This is a specific kind of data base manager. It is popular because it can keep files of information, as you would keep folders in a file cabinet. All of the material in each file is related to the main topic so that information can be searched for quickly and efficiently. |
| ____HARD DISK: | J. This is a very common acronym that denotes a broad class of instructional programs. Generally they include drill and practice, tutorials, and simulations. |

____ICAI:

____INTEGRATED PACKAGES:

____INTERFACE:

____K:

____MENUS:

____NETWORKING:

____SOFTWARE:

____VIDEODISK INSTRUCTION:

____80 COLUMN FORMAT:

____80 COLUMN CARD:

K. EXTRA KEYS ON THE COMPUTER KEYBOARD, USUALLY TO THE RIGHT AND/OR ON TOP. THEY PERMIT THE USER TO PERFORM EXTRA TASKS.

L. A PIECE OF HARDWARE THAT IS OFTEN ADDED TO THE COMPUTER IN ORDER TO ALLOW A "FULL" TEXT (OR 80 CHARACTERS) ON THE SCREEN.

M. IT IS AN APPLICATION PROGRAM THAT STORES A GREAT DEAL OF INFORMATION.

N. THE PROGRAMS THAT RUN ON THE MACHINE. THEY ARE USUALLY ON FLOPPY DISKS, SOMETIMES ON TAPES.

O. A TYPE OF DISK DRIVE THAT OFTEN ATTACHES TO THE COMPUTER. UNLIKE AN ORDINARY DISK DRIVE, IT STORES MUCH MORE INFORMATION AND, CONSEQUENTLY, IS USUALLY MUCH MORE EXPENSIVE.

P. APPLICATION PROGRAMS THAT COMBINE AN ELECTRONIC SPREADSHEET, A WORD PROCESSOR, A DATA BASE MANAGER, ETC., INTO ONE SOFTWARE. THIS MEANS THAT ALL OF THESE DIFFERENT PROGRAMS CAN BE USED BY THE COMPUTER AT THE SAME TIME.

Q. SOFTWARE PROGRAMS DESIGNED TO DO SPECIAL JOBS, SUCH AS WORD PROCESSING, SAVING INFORMATION, AND HELPING CALCULATE BUDGETS.

R. THE MACHINE ITSELF AS WELL AS ANY OTHER DEVICES, SUCH AS DISK DRIVES, MONITORS, PRINTERS, ETC.

S. STUDENTS ALL WORK ON THE SAME CAI PROGRAM AT THE SAME TIME. THIS IS DIFFERENT FROM ONE STUDENT AT A COMPUTER DOING ONE PROGRAM, ANOTHER STUDENT AT ANOTHER COMPUTER WORKING ON ANOTHER PROGRAM, ETC. IT IS RELATED TO THE CONCEPT OF NETWORKING.

T. THIS KIND OF PROGRAMMING IS FAR MORE COMPLICATED THAN TYPICAL FORMS OF CAI. THESE PROGRAMS ATTEMPT TO "DIAGNOSE" THE LEARNER'S ERRORS OR RESPONSE PATTERNS, AND THEN ACT ON THESE PATTERNS. DIFFERENT KINDS OF FEEDBACK ARE PRESENTED DEPENDING ON THE DIAGNOSIS. STUDENTS ARE ENCOURAGED TO INDUCE ANSWERS BASED ON SELECTED INFORMATION PROVIDED BY THE PROGRAM.

ANSWER KEY

Q____APPLICATION PROGRAMS

J____CAI

M____DATA BASE

I____FILER PROGRAM

D____FLOPPY DISK

K____FUNCTION KEYS

S____GROUP CAI

R____HARDWARE

F____HARDWARE COMPATIBILITY

O____HARD DISK

T____ICAI

P____INTEGRATED PACKAGES

B____INTERFACE

A____K

H____MENUS

G____NETWORKING

H____SOFTWARE

C____VIDEODISK INSTRUCTION

E____80 COLUMN FORMAT

L____80 COLUMN CARD

## Activity #2

1. Divide into groups of 3 or 4.

2. Determine a size of a school district (small, medium, large).

3. Agree on a budget for next year's purchases.

4. You will be purchasing computers and software for classrooms at all grade levels and types of settings (including administrative settings).

5. Use the cost sheet and the features sheet provided to make decisions on purchases.

6. Round off the cost of computer equipment to the nearest $50.

7. Assume that all education software will cost $40 each.

8. Assume that all application software will cost $70.

9. Networking is not allowed (reason: the price varies too much for each computer).

10. Hard disks cost $1500.

11. Remember, you must first identify who will use the computers and then decide on what you will purchase.

12. Be prepared to justify all decisions.

AN EXAMPLE OF PART OF THE EXERCISE:

YOU DECIDE TO BUY 10 FRANKLIN 1000S AND 10 WORD PROCESSING PROGRAMS FOR A HIGH SCHOOL BUSINESS CLASS. THE CHEAPEST COST FOR THAT EXPENDITURE ALONE IS $6500 FOR THE COMPUTERS, DRIVES, AND MONITORS, AND $700 FOR THE SOFTWARE. TOTAL: $7,200.

BE IMAGINATIVE WITH YOUR DECISIONS

## COMPUTER PRICES SUMMER 1984*

| | List Price | Discount Store | Educator's Price Authorized Dealer |
|---|---|---|---|
| ATARI 800XL | | | |
| 64K RAM, 1 DISK DRIVE | $680 | $537 | $567 |
| 64K RAM, 2 DISK DRIVES | $1130 | $846 | $890 |
| APPLE IIe | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $1550 | $1000 | $850 |
| 64K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | $1879 | $1350 | $1080 |
| 128K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | $1845 | $1129 | $1056 |
| COMMODORE 64 | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | — | $540 | $540 |
| 64K RAM, COLOR MONITOR, 1 DISK DRIVE | — | $640 | $680 |
| 64K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | — | $780 | $780 |
| FRANKLIN ACE | | | |
| 64K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | — | $895 | $640 |
| 64K RAM, COLOR MONITOR, 1 DISK DRIVE | — | $1055 | $790 |
| 64K RAM, MONOCHROME MONITOR, 2 DISK DRIVES | — | $1095 | $825 |
| 128K RAM, MONOCHROME MONITOR, 1 DISK DRIVE | — | $1054 | $825 |

| | List Price | Discount Store | Educator's Price Authorized Dealer |
|---|---|---|---|
| IBM PC | | | |
| 64K RAM, monochrome monitor, 1 disk drive | $2090 | $1800 | $1672 |
| 64K RAM, RGB monitor, 1 disk drive | $2770 | $2344 | $2216 |
| 64K RAM, monochrome monitor, 2 disk drives | $2515 | $2140 | $2012 |
| 128K RAM, monochrome monitor, 1 disk drive | $2190 | $1860 | $1752 |
| IBM PCjr | | | |
| 128K RAM, monochrome monitor, 1 disk drive | $1275 | $1000 | $1020 |
| 128K RAM, RGB monitor, 1 disk drive | $1680 | $1320 | $1324 |
| 128K RAM, monochrome monitor, 2 disk drives | $1700 | $1239 | $1360 |
| RADIO SHACK COLOR COMPUTER 2 | | | |
| 64K RAM, 1 disk drive | $660 | — | $515 |
| 64K RAM, 2 disk drives | $940 | — | $734 |
| TRS-80 MODEL 4 | | | |
| 64K RAM, monochrome monitor, 1 disk drive | $1600 | — | $1247 |
| 64K RAM, color monitor 2 disk drives | $1920 | — | $1506 |
| 128K RAM, monochrome monitor, 1 disk drive | $1680 | — | $1309 |

* Note: Prices vary greatly depending on time and region. These were effective in the New York area in summer 1984.

(from Electronic Learning Magazine Sept. 1984)

## ACTIVITY #3

## DEBATABLE QUESTIONS

TIME: 15 MINUTES

LISTED BELOW ARE A SERIES OF STATEMENTS DESIGNED TO STIMULATE GROUP DISCUSSION. THE PARTICIPANTS OR THE PRESENTER SHOULD SELECT THE STATEMENTS TO BE DISCUSSED. THE GROUP SHOULD ATTEMPT TO FOCUS ON THE PROS AND CONS OF EACH STATEMENT--THERE ARE NO "CORRECT" ANSWERS.

1. "COMPUTERS ARE JUST ANOTHER FAD. IN A FEW YEARS THEY WILL DISAPPEAR INTO CLOSETS LIKE FILMSTRIP PROJECTORS."
2. "THE MAIN IMPETUS FOR THE USE OF COMPUTERS IN THE SCHOOLS HAS BEEN ORGANIZED BY COMPUTER MANUFACTURERS--NOT EDUCATORS."
3. "ALL INSTRUCTIONAL SOFTWARE IS JUNK."
4. "THE BIGGEST IMPEDIMENT TO THE INTRODUCTION OF COMPUTERS IN THE SCHOOLS IS THE LACK OF TEACHER TRAINING IN THE USE OF COMPUTER TECHNOLOGY."
5. "SCHOOLS SHOULD NOT INVEST MONEY IN COMPUTER HARDWARE BECAUSE NEW DEVELOPMENTS IN THE FIELD ARE OCCURRING SO RAPIDLY."
6. "BY THE END OF THIS DECADE, TECHNOLOGICAL DEVELOPMENTS WILL RADICALLY ALTER PRESENT-DAY INSTRUCTIONAL METHODS."
7. "SCHOOLS SHOULD TEACH ALL STUDENTS HOW TO USE COMPUTERS."
8. "MOST COMPUTER-USING EDUCATORS ARE MALE SECONDARY-SCHOOL TEACHERS."

# III. MASTERS FOR HANDOUTS

## General Notes on Handouts

The following handouts provide useful general information administrators can use or refer to later on when making decisions about computer and software purchases for their schools or districts.

You may decide that the list of references and some of the overheads also lend themselves to reproduction as handouts.

Look especially at Handouts #4A and #4B. You may wish to suggest other possible programs in each of the categories listed. Check with your local ESD to learn if it has some of these programs available in its software library. Depending on your own knowledge of or experience with computers, you may wish to demonstrate some of the software mentioned in this guide as part of your presentation or as a separate workshop.

HANDOUT #1

1. GENERAL HARDWARE AND SOFTWARE CONCERNS

*WHICH TYPE OF MICROCOMPUTER IS IT DESIGNED FOR? DOES THE DISTRICT HAVE THAT KIND? IF NOT, WHAT DOES IT COST?

*IS A HARD DISK REQUIRED? IF SO, WHAT IS ITS COST?

*CAN THE PROGRAM BE UPLOADED/DOWNLOADED INTO OTHER COMPUTERS?

*ARE THERE ADDITIONAL COSTS RELATED TO THE SOFTWARE? UPDATES? MODIFICATIONS? CONSULTANT FEES?

*IS THE PROGRAM WELL DOCUMENTED, INCLUDING A CLEARLY WRITTEN MANUAL?

*CAN IT BE LINKED TO OTHER SOFTWARE (E.G. WISC-R SCORING LINKED TO COMPUTERIZED NORM REFERENCE TEST SCORING)?

2. SPECIFIC IEP MANAGER COMPONENTS: WHAT EXISTS AND WHAT CAN BE MODIFIED?

*DOES IT INCLUDE THE STANDARD IEP REQUIREMENTS (E.G. GOALS AND OBJECTIVES, PARENT NOTIFICATION, ANNUAL REVIEW AND THREE YEAR EVALUATION FORMS)?

*IS THERE CAPACITY FOR ADMINISTRATIVE REPORTS AT THE DISTRICT AND STATE LEVEL?

*ARE THERE ADDITIONAL STUDENT INFORMATION FUNCTIONS INCLUDED (E.G. REPORT CARDS, CLASS SCHEDULES, STATISTICAL INFORMATION ON STUDENT PROGRESS)?

*HOW EASY IS IT TO CHANGE STUDENT DATA? DOES ALL OF THE DATA HAVE TO BE RE-ENTERED?

*DOES THE PROGRAM PROVIDE A CLEAN, NICELY FORMATTED HARD COPY OF THE IEP?

*MOST OF ALL, HOW EASY IS THE SYSTEM TO USE? CAN A NOVICE LEARN THE ENTIRE SYSTEM OR AT LEAST ITS IMPORTANT PARTS?

HANDOUT #2

## STRATEGIES FOR SUCCESSFULLY IMPLEMENTING COMPUTERS IN EDUCATION

- ESTABLISH AN ONGOING, COMPREHENSIVE TRAINING PROGRAM FOR ALL SCHOOL PERSONNEL INTERESTED IN USING COMPUTERS.

- ESTABLISH A METHOD FOR EVALUATING SOFTWARE THAT INCLUDES INPUT FROM THOSE WHO WILL BE USING IT.

- INCLUDE ENOUGH MONEY IN YOUR MICROCOMPUTER BUDGET TO BE ABLE TO BUY AN ADEQUATE VARIETY OF SOFTWARE.

- GIVE TEACHERS AN OPPORTUNITY FOR HANDS-ON INTERACTION WITH THE COMPUTERS DURING A TIME WHEN THEY AREN'T SUPERVISING STUDENTS.

  (THIS CAN BE DONE BY GIVING RELEASED TIME DURING THE SCHOOL DAY OR BY LETTING TEACHERS TAKE EQUIPMENT HOME AT NIGHT, OVER THE WEEKEND, OR DURING THE SUMMER.)

- START A COMPUTER USER GROUP IN THE SCHOOL TO ENCOURAGE REGULAR INSTRUCTION OF USERS.

- ESTABLISH A SCHOOL-WIDE OR SYSTEM-WIDE NEWSLETTER. A NEWSLETTER PROVIDES A WAY FOR USERS TO BECOME PERSONALLY INVOLVED IN SHARING IDEAS.

- PROVIDE A VARIETY OF PROFESSIONAL MICROCOMPUTER JOURNALS AND PUBLICATIONS. THIS IS THE MOST REALISTIC METHOD OF STAYING CURRENT WITH SUCH A RAPIDLY CHANGING TECHNOLOGY.

- ENCOURAGE COMPUTER USERS IN YOUR SCHOOL TO ATTEND AND TO MAKE PRESENTATIONS AT PROFESSIONAL CONFERENCES AND WORKSHOPS.

- PROVIDE ENCOURAGEMENT AND REWARD BY RECOGNIZING INDIVIDUAL EFFORTS AND ACCOMPLISHMENTS.

- FINALLY, DON'T EXPECT MAGIC FROM TECHNOLOGY!

HANDOUT #3

RECOMMENDED COMPUTER PUBLICATIONS

CLASSROOM COMPUTER LEARNING
5615 West Cermak Road
Cicero, Illinois 60650

THE COMPUTING TEACHER
University of Oregon
Eugene, Oregon 97403

ELECTRONIC EDUCATION
Suite 220
1311 Executive Center Drive
Tallahassee, Florida 32301

ELECTRONIC LEARNING
TEACHING AND COMPUTERS
902 Sylvan Avenue
Englewood Cliffs, New Jersey 07632

INFOWORLD
375 Cochituate Road
Box 800
Framingham, Massachusetts 07170

HANDOUT #4A

# RECOMMENDED SOFTWARE FOR A SHORT COMPUTER INSERVICE

## INTEGRATED PROGRAM

PROGRAM TITLE: APPLEWORKS DEMO
PUBLISHED BY: APPLE COMPUTER, INC.
AVAILABLE FOR: APPLE

## GRADE BOOK

PROGRAM TITLE: REPORT CARD
PUBLISHED BY: SENSIBLE SOFTWARE
AVAILABLE FOR: APPLE

## WORD PROCESSING

PROGRAM TITLE: THE BANK STREET WRITER
PUBLISHED BY: BRODERBUND
AVAILABLE FOR: IBM, APPLE, COMMODORE 64, ATARI

## PROGRAMMING

PROGRAM TITLE: LOGO
PUBLISHED BY: VARIOUS PUBLISHERS
AVAILABLE FOR: IBM, APPLE, COMMODORE 64, ATARI, TANDY COLOR COMPUTER (RADIO SHACK)

## DRILL AND PRACTICE

PROGRAM TITLE: MASTER MATCH
PUBLISHED BY: DLM TEACHING RESOURCES
AVAILABLE FOR: IBM, APPLE, COMMODORE 64, ATARI

## TUTORIAL

PROGRAM TITLE: SRA WRITING SKILLS: PUNCTUATION DEMO
PUBLISHED BY: SCIENCE RESEARCH ASSOCIATES
AVAILABLE FOR: IBM, APPLE

SIMULATION

PROGRAM TITLE: OH, DEER!
PUBLISHED BY: MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM
AVAILABLE FOR: IBM, APPLE, COMMODORE 64

INSTRUCTIONAL GAME

PROGRAM TITLE: MICROTYPE: THE WONDERFUL WORLD OF PAWS DEMO
PUBLISHED BY: SOUTHWESTERN PUBLISHING COMPANY
AVAILABLE FOR: APPLE

COMPREHENSIVE COMPUTER ASSISTED INSTRUCTION DEMO DISK

PROGRAM TITLE: MECC SAMPLE PROGRAMS
PUBLISHED BY: MINNESOTA EDUCATIONAL COMPUTING CONSORTIUM
AVAILABLE FOR: APPLE